MACHINERY

DESIGN — CONSTRUCTION — OPERATION

Volume 37 OCTOBER, 1930 Number 2

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Total Distribution for September, 17,228 Copies

Product Index 292-314 Advertisers Index 317-318

PUBLISHED MONTHLY BY

THE INDUSTRIAL PRESS, 140-148 LAFAYETTE STREET, NEW YORK

ALEXANDER LUCHARS, President ROBERT B. LUCHARS, Vice-President EDGAR A. BECKER, Treasurer
ERIK OBERG, Editor FRANKLIN D. JONES, Associate Editor CHARLES O. HERB, Assistant Editor FREEMAN C. DUSTON, Assistant Editor
LONDON: 52 Chancery Lane PARIS: 15 Rue Bleue

YEARLY SUBSCRIPTION: United States and Canada, $3 (two years, $5); foreign countries, $6. Single copies, 35 cents.

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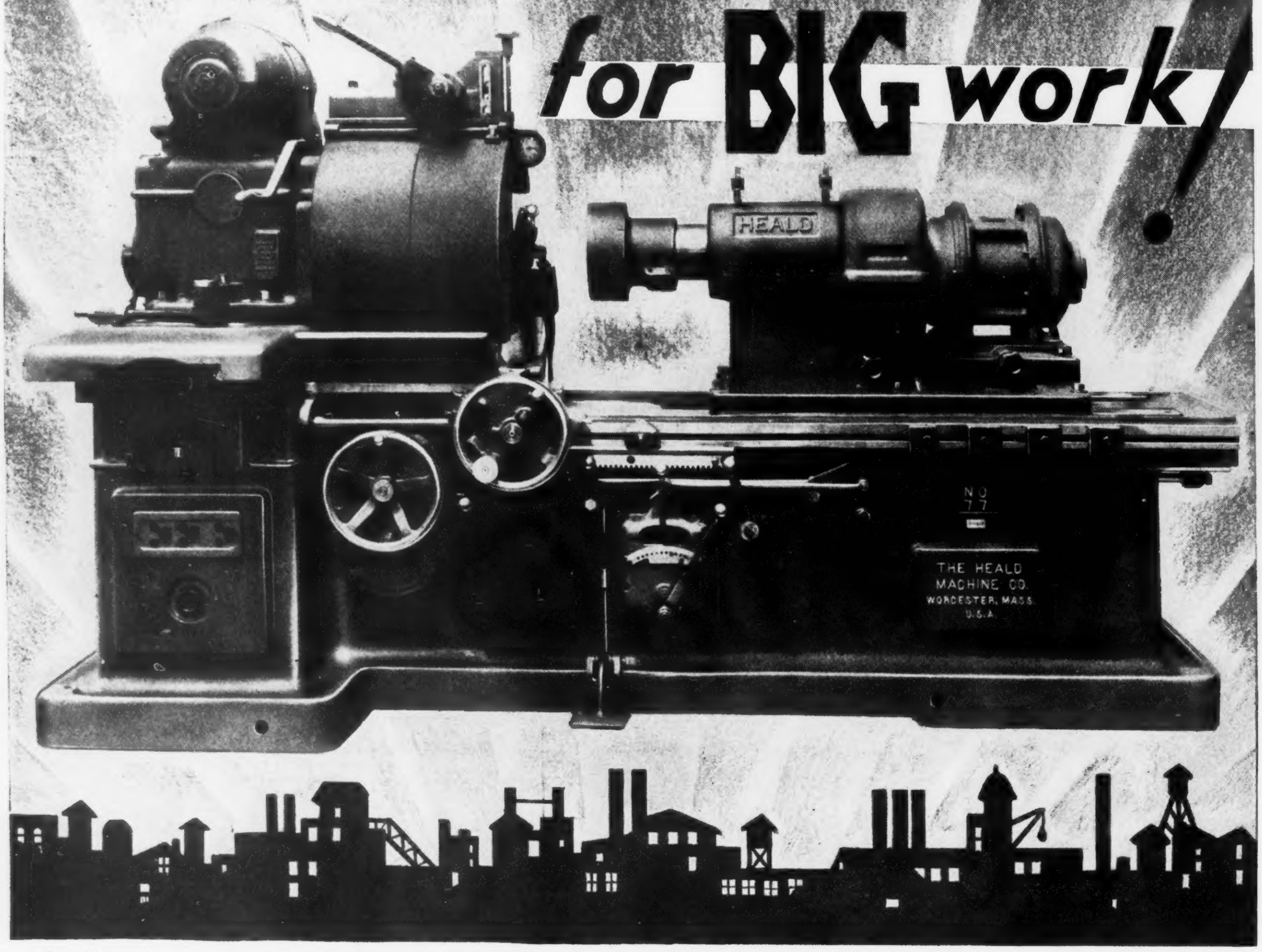

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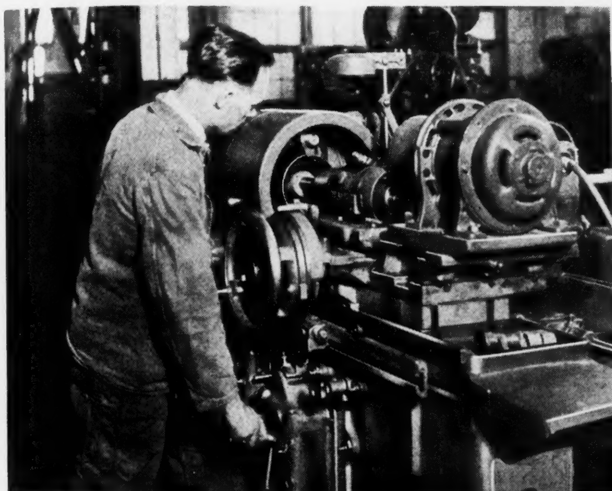
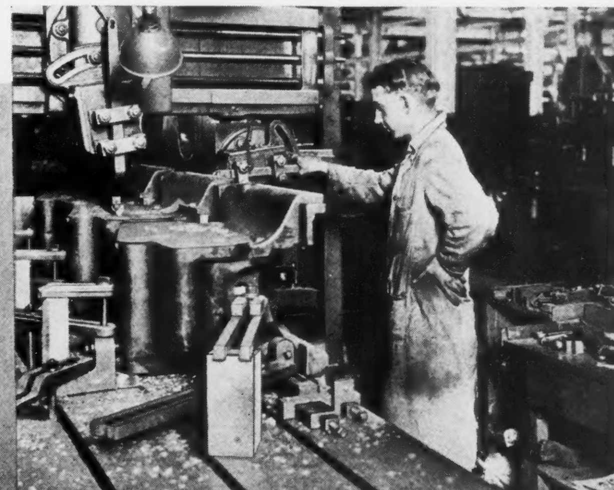




Can We Afford to Neglect Trade Training?

The Need for Industrial Training, and Especially for Systematic Training of Apprentices, Cannot be Emphasized Too Much—We Need Action

By C. J. HARTER, General Manager, Harter Educational and Engineering Service, West Boylston, Mass.

THE law compels children to be educated in the public schools until they have reached a certain age. There is, also, an unwritten economic law that says that if industry is to be conducted in a rational manner and develop along lines satisfactory to business and to the community, provision must be made for the education of young people after they have finished school. Only in that way can they be trained to take their places as useful citizens in our industrial system.

The latter law is not being observed as well as it ought to be by those who are in control of industry. The result is inefficiency among industrial workers who have not been properly trained for the work they are engaged in. There are only a few exceptional plants that have a well defined system of apprentice or employe training.

It is of as much importance that industry should develop the human factor as it is that it should improve materials of construction. Tremendous effort is put forth in the development of materials. Take steel, for example, and consider the experimental work that is done in order to obtain steel of the highest quality. All the methods are watched from the time the ore is brought out of the ground until the steel emerges from the mill.

But how much thought is being given in industry to the development of the human factor? What opportunities are available for a boy who has been compelled to leave public school at the age of fourteen or sixteen? He starts out in quest of a job, calling at all sorts of places where he thinks he may earn something, and nine times out of ten he takes a job for which he is not fitted and for which he has no training—a job that holds no hope for him of becoming of greater value to the company or to himself than he is at the beginning.

There is not much difference in the opportunities available for the average high-school graduate when the time comes for him to get a job. Yet here we have material having characteristics that may be developed to the advantage of industry, the individual, and the community. All that is lacking is concerted effort to bring about this development. In too many industrial plants, the human element is given little consideration, with the result that we have a great mass of both young men and older workers who are floating around like chips in a whirlpool, not headed in any particular direction.

The lack of systematic industrial training brings about maladjustment and many difficulties in industry. Consider the case of an established concern

that finds it necessary to increase the number of men employed because of increasing business. Under present conditions, the usual practice is to hire skilled men from other plants to form a nucleus around which an organization may be built to meet the production requirements.

This practice has two serious faults: First, it increases production costs, because an increased wage is paid in order to entice the other fellow's skilled workers; and second, the effect on the other firm's business may be serious, with the result that there is a tendency to weaken the whole economic structure.

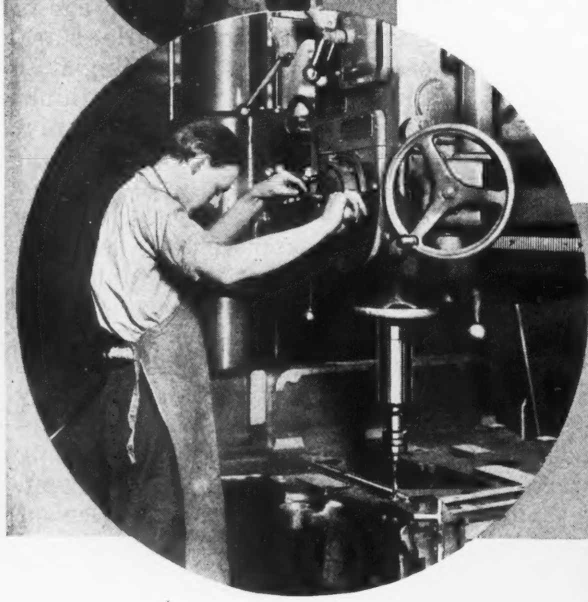
American Industry Must Stop Saying, "Let the Other Fellow Do the Training"

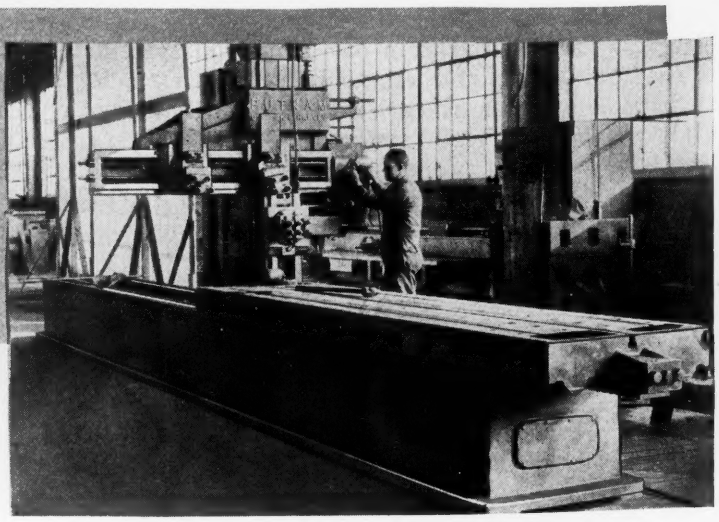
Apprentices are being trained in progressive machine shops not only to become skilled machinists but also salesmen and designers

Industry has long neglected the important fact that its efficiency will depend largely upon how the younger generation is being trained to fill its duties

The remedy for these unsatisfactory conditions lies in the provision of sufficient training facilities in every shop, so that an adequate number of skilled men may be trained. Facilities for doing this cannot be developed over-night, but it is surprising how quickly the results will become apparent when a properly organized and controlled training system is installed. The problems to be met in training young men for one trade are, of course, different from those required in training for another occupation; and special training methods should be applied to further develop men who already have had a general trade training. The failure to recognize the problems involved and to apply the correct solution in each case is one of the reasons why more progress has not been made.

All industries have the nucleus for training well established in their regular production departments. It is not sufficient, however, to depend upon these departments alone. Many have tried the haphazard method of hiring a few boys, calling them apprentices, and allowing them to drift through the shop during a period of years. Then it is expected that the boys will suddenly prove to be skilled mechanics. This method is obsolete, and because many companies have failed to develop the right kind of mechanics in this way, they throw up their hands and blame the boys for their failure, adding that the boys they get nowadays as apprentices are not what they used to be.





An apprentice system, to be successful, must provide a complete and varied training in all departments

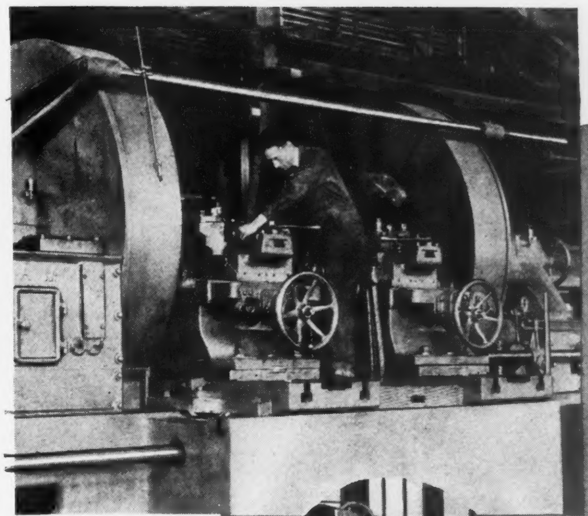
The blame should not be placed on the boys, but on the management who has attempted to do something without an adequate study of the problems involved and without the proper organization. There are today approximately 3,000,000 skilled workers in all industries in the United States. Approximately, 150,000 of these men are lost to the trades and industries each year due to death and other causes. Now, considering that, on an average, four years are required to complete the training of an apprentice, there should be at least 800,000 boys being trained in order to have approximately 150,000 graduate at the end of a four-year apprenticeship.

The latest statistics show that instead of 800,000 being in training, there are only about 150,000 being trained. Where does this lead us? Will we be able to maintain our industrial supremacy if these conditions are not remedied? Furthermore, is it sufficient merely to replace the skilled workers that drop out of the industries? Should we not provide for the normal expansion of our industries as the years go by?

There Are Plenty of Boys Eager for an Apprentice Training

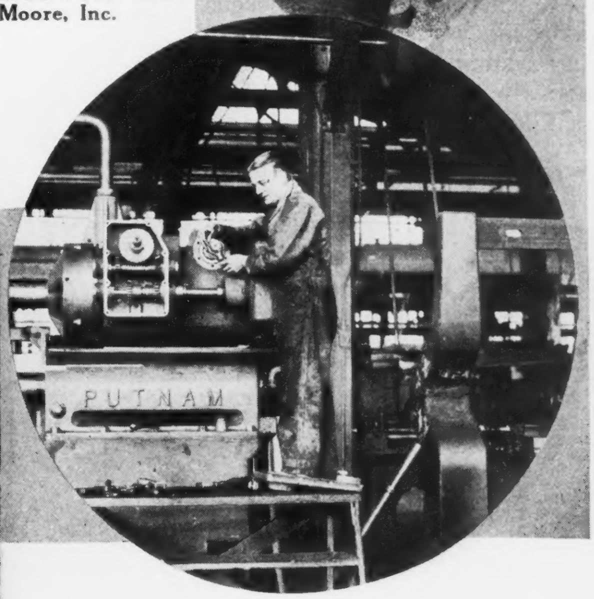
How many times we hear manufacturers and mechanical executives say: "Boys are different nowadays; they do not want to learn a trade." This is a falacious belief. It is founded simply upon erroneous opinion and not in the least on facts. Having had many years' experience in apprentice training, the writer knows that there are just as many boys ambitious to learn a trade today as there ever were.

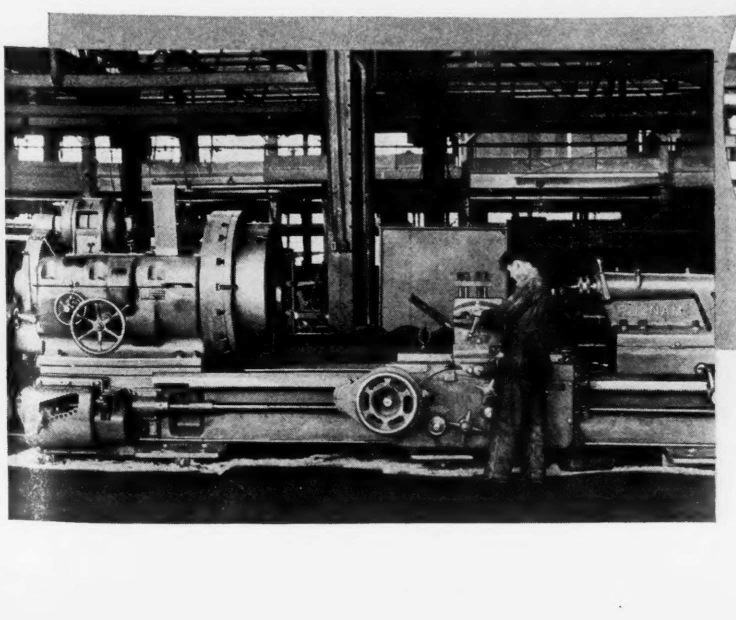
The reason there appears to be a shortage of apprentice material is because so many plants do not have a recognized training system. In some shops, the apprentices have been exploited. They have been put on regular production work at small pay and have not received an adequate all-around training. Under such conditions, what is more natural than that the information is passed around in the neighborhood that boys should not take a chance on an apprenticeship, because they will only be wasting three or four years of their time?



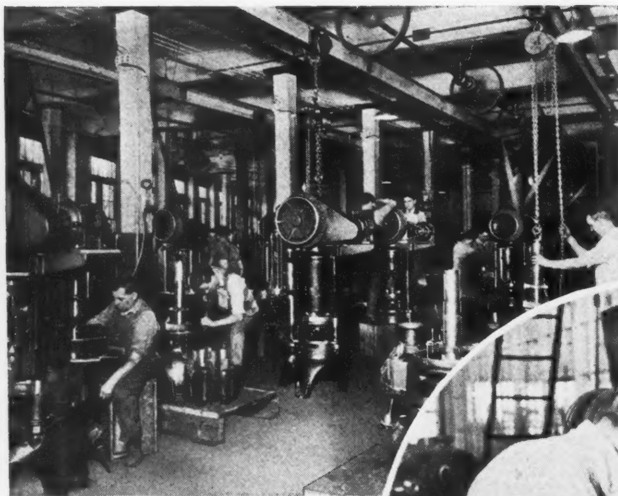
Manufacturers who have seriously engaged in apprentice training have achieved highly satisfactory results

The engravings show boys being trained in the shops of Heald Machine Company; Rice, Barton & Fales, Inc.; and Manning, Maxwell and Moore, Inc.

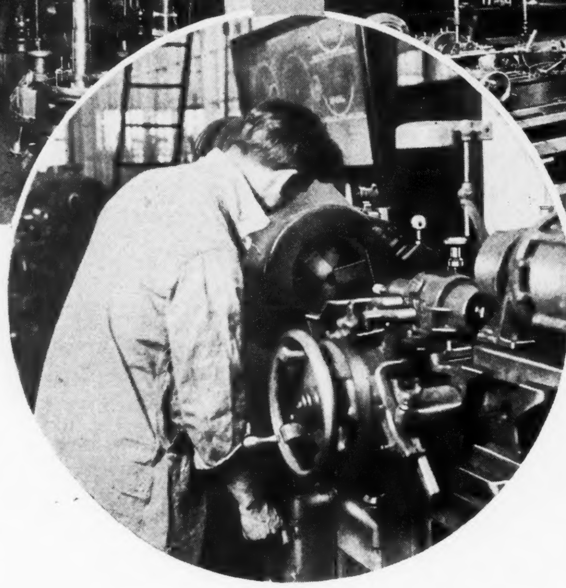




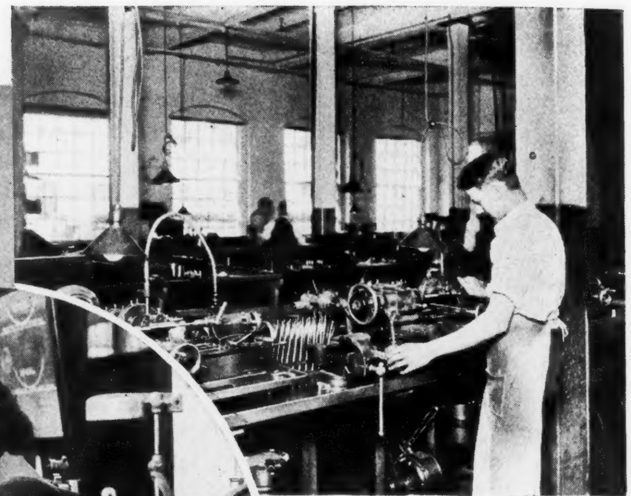
It is not enough to hire boys to become apprentices—their training must be systematic and carefully supervised



Machinist apprentices assembling special machinery as part of their training in the plant of the Taft-Peirce Mfg. Co.



A young man being trained for sales work, serving an apprenticeship in the shops of the Heald Machine Co.



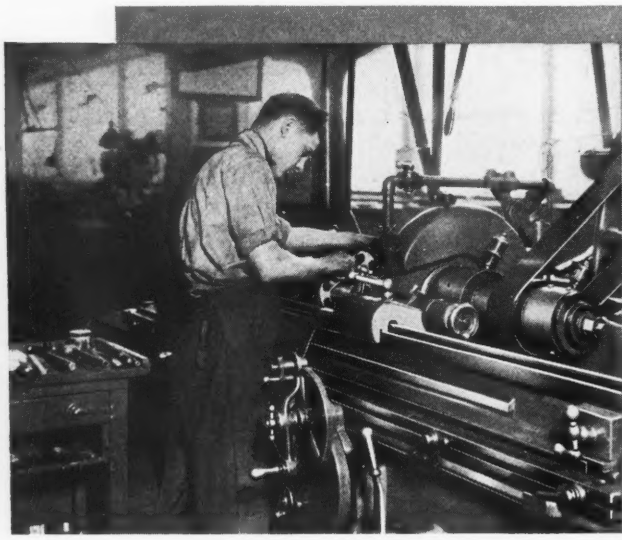
Most machine shops have a sufficiently varied class of work to permit an apprentice to obtain an all-around training

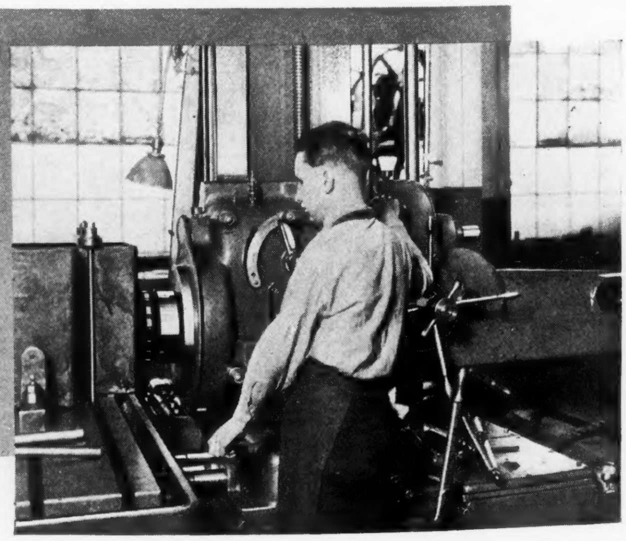
Against this condition may be set the fact that shops having a well organized system of training are able to select the highest types of boys, because they are assured of at least twice as many applicants as they can employ. There are shops on record where over 150 applicants are on the waiting list to fill only twenty vacancies. This is in a machine shop apprentice training course. As a result, the apprentice boys selected are the finest group of young men that can be found anywhere.

When business is prosperous, manufacturers are more likely to consider the establishment of a training system than in dull times; but there is no reason why a manufacturer should wait until his plant is filled with rush orders to consider his lack of preparation for a period of good business.

There are just as many arguments in favor of training apprentices during dull periods of business as there are for training them in rush periods. In dull periods there is likely to be a higher grade of material available for training. Everyone concerned has more time to consider the details of the problems to be solved, and more rapid progress can be made in establishing a training course. Dull business periods, therefore, do not furnish a good excuse for refusing to consider the training problem.

Subsequent articles in this series will deal with the principal problems to be considered in establishing training methods in industrial plants.





Notes and Comment on Engineering Topics

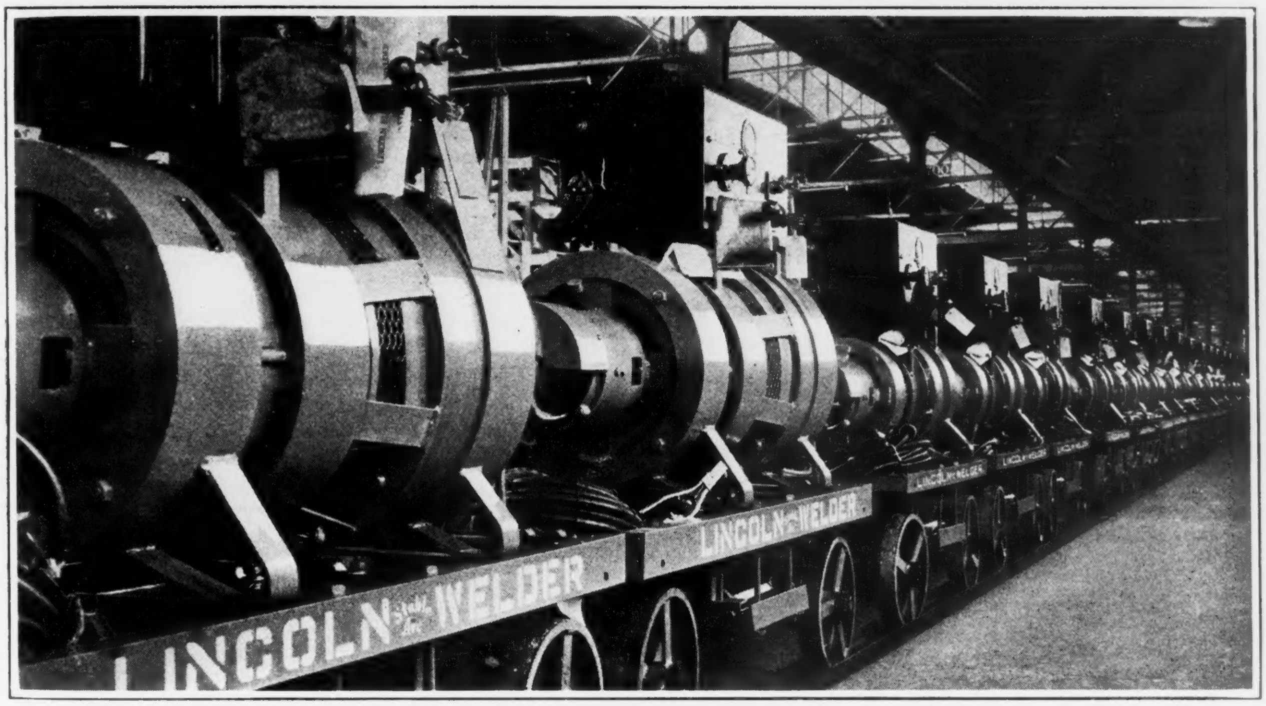
Increasing Use of Rustless Steel—Delivering Heavy Machinery by Airplane—Huge Blast Furnace Blowers—New Sales Promotion Methods

It is expected that the Ford Motor Co. alone will use 8500 tons of rustless steel sheets annually in the manufacture of the bright polished parts for Ford cars, such as the radiator shell, lamps, and caps.

According to information obtained from the National Power Machinery Corporation, New York City, agents for Escher Wyss & Co., Zürich, Switzerland, what are said to be the two largest blast furnace blowers ever built are under construction at the Escher Wyss plant, for the Tata Iron & Steel Co., Ltd., of India. Each of these steam-turbine-driven blowers delivers 130,000 cubic feet of free air per minute, the steam turbines having a capacity of 13,700 horsepower each. Each unit will furnish the blast for a single furnace having a capacity of about 1600 tons of pig iron per day.

What is believed to be the first airplane shipment of heavy equipment was recently made by the Louis Allis Co., Milwaukee, Wis., who sent a motor-driven frequency converter set for a motion picture house by plane from Milwaukee to Grand Rapids, Mich. The converter set weighed 650 pounds and was urgently needed. It was delivered by auto from the landing field to the theatre in Grand Rapids ninety minutes after leaving the Milwaukee factory.

An interesting use was made of airplane transportation by William Sellers & Co., Philadelphia, Pa., in connection with a recent exhibition at Atlantic City. Many of the heavy machine tools built by the company could be inspected advantageously only at the plant in Philadelphia, because their large size made it impracticable to place them on exhibition at Atlantic City. The company chartered an airplane, and during the exhibition four trips a day were made between Atlantic City and Philadelphia, carrying important railroad executives between the Sellers plant and its exhibition booth. The entire air trip, including the automobile rides to and from the airports, consumed only one hour. About an hour was spent in the plant and another hour was used for the return trip.



The automobile field is not the only one where straight-line production methods are applied. The illustration shows the assembly and final inspection line of arc welders in the plant of the Lincoln Electric Co., Cleveland, Ohio, where the same principle is used

According to figures published by the Bureau of the Census, close to 306,000 bicycles valued at over $6,180,000 were manufactured in 1929, as compared with 255,000 in 1927.

Designing Dies for Difficult Cup-Forming

Press Operations on Oil-cups, and the Use of Coning Dies which Increase the Thickness of the Walls at Certain Points

By F. E. SHAILOR

IN drawing sheet-metal shells such as shown at *A*, Fig. 1, a number of reducing dies must be used to draw the shell gradually deeper without thinning the walls too much at each operation. In many cases, shells of this kind crack or pull apart long before the desired depth is obtained. In view of these commonly experienced difficulties, the majority of die designers would consider it practically impossible to design a set of dies that would produce the shell shown at *B*, Fig. 1, from sheet steel 0.078 inch thick, having walls at *a* two or three times as thick as the original sheet stock.

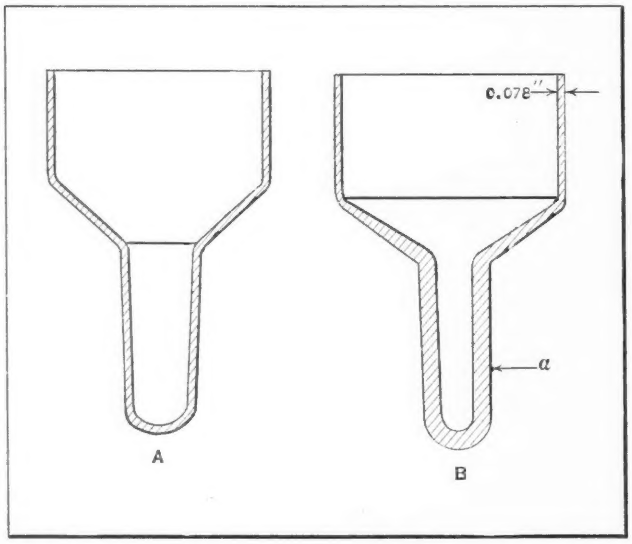


Fig. 1. (A) Shell Produced by Deep Drawing; (B) Drawn Shell with Walls Thickened by a Coning Die

Before describing the die used in producing such a shell, it may be well to refer to Fig. 2, which shows each successive step in the sequence of operations required to produce the oil-cup *I*. The view at *E* shows the shell as it appears at the last drawing operation. It will be noted that the walls at *a* are considerably thinner than 0.078 inch, which was the original thickness of the stock. This is due, of course, to the stretching of the metal which occurs during all drawing operations. The stretching and thinning of the walls in this manner makes it necessary to employ a large number of drawing operations in producing a deep shell, and is one of the most important factors for the designer to consider.

Dies Used to Increase Thickness of Shell

By the use of so-called "coning" dies, the walls of the shell can be thickened any desired amount within reason. The walls can easily be made several times thicker than the sheet metal from which

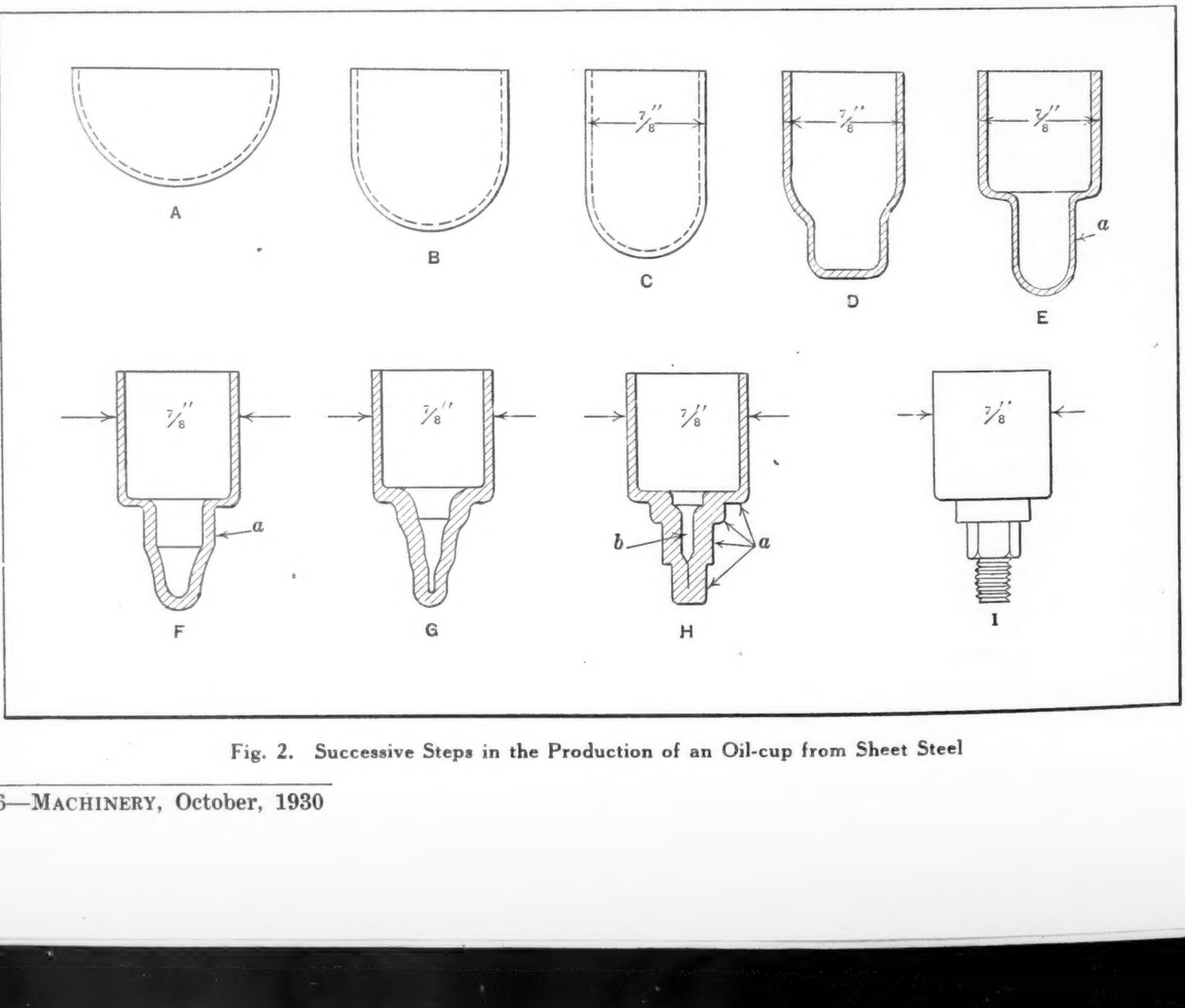


Fig. 2. Successive Steps in the Production of an Oil-cup from Sheet Steel

the blank is punched. Fig. 3 shows the assembly of a coning die used to thicken the walls of the shell. The views at *E* and *F*, Fig. 2, show the shell before and after the coning operation is performed.

The action of the coning die is directly opposite that of a drawing die, for in the so-called "coning" operation, the metal is actually pushed or forced into the desired shape, thus thickening the walls of the shell. By designing the end or tip of the pilot properly, the walls can be thickened at any particular spot. The variation in the thickness of the walls at the points shown at *a* in view *H*, Fig. 2, are easily obtained in this way.

Referring to view *F*, Fig. 2, which shows the shell as it appears after the first coning operation, it will be noted that the walls at *a* are considerably thicker than the walls at *a* in view *E*. As a matter of fact, the walls at *a* in view *F* are thicker than the original stock. In view *H*, a slight space is shown between the walls at *b*, but if desired, the walls could be entirely closed in at this point, as indicated at the lower end.

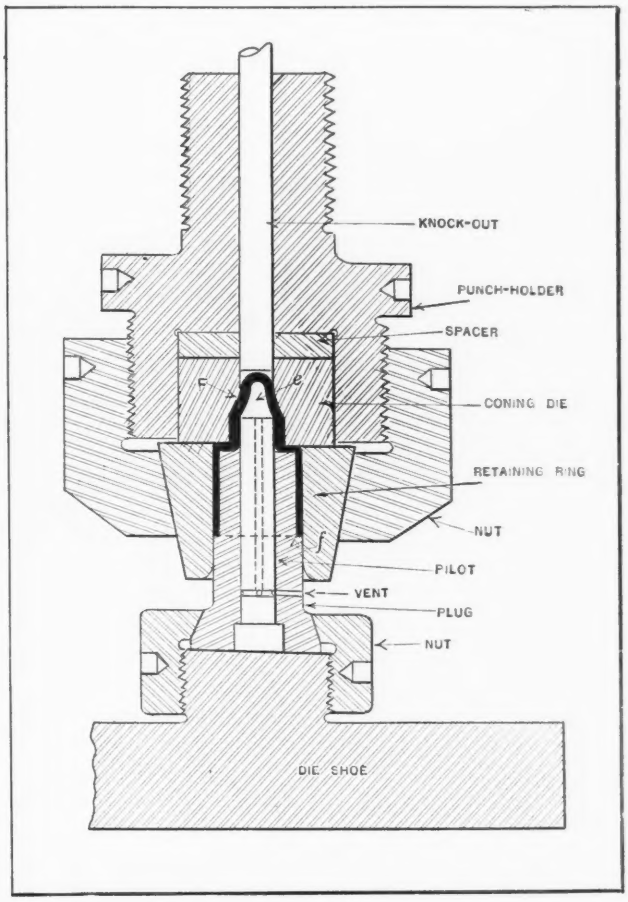


Fig. 3. Coning Die for Thickening Walls of Shell

Finding the Blank Diameter

The methods used in determining the diameter of the blank required to produce a shell with ordinary drawing dies could not be used satisfactorily for finding the blank diameter for a shell such as shown in Fig. 2. If a completed sample shell is available, it is an easy matter to cut a blank of a diameter that will balance the weight of the completed shell. Otherwise, the safest way of determining the diameter of the blank is accomplished by the use of the cut-and-try method.

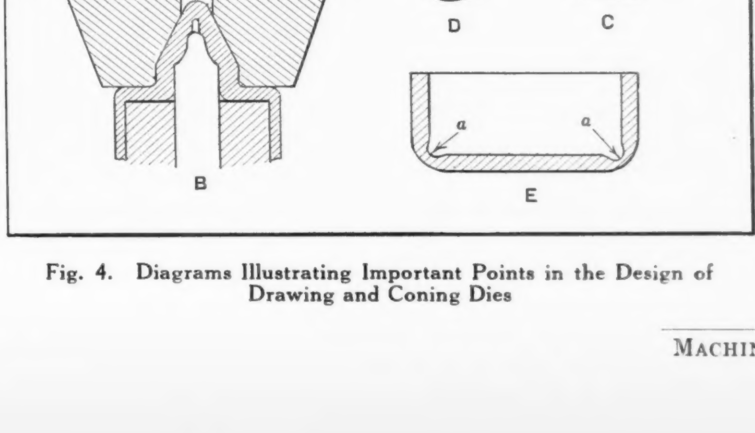


Fig. 4. Diagrams Illustrating Important Points in the Design of Drawing and Coning Dies

After the blank diameter has been determined, the first step in producing the cup *I* is a blank and draw operation, which forms the shell to the shape shown at *A*, Fig. 2. This shell should be well rounded at the bottom to avoid straining the metal unduly in the succeeding operations. The second operation forms the shell to the shape shown at *B*. In this operation, the diameter of the shell should not be reduced more than 30 per cent.

Following the second operation, or first redrawing operation, the shell should be annealed. The third operation, which forms the shell to the shape shown at *C*, should not reduce the diameter more than 25 per cent. In some cases, particularly when thinner metal is used, the reduction should not be as great as 25 per cent at the second redrawing operation.

The reduction in diameter is continued by redrawing operations until the finished outside diameter is obtained. Less reduction takes place at each succeeding operation. After the finished outside diameter is obtained, the rounded bottom of the shell is formed, as indicated at *D*, Fig. 2. In this operation, the shell is shaped more by the punch than by the die. This slow reduction of the smaller portion of the shell by redrawing is continued until the desired length is obtained, or until the metal cannot be subjected to further stretching without breaking. One more redrawing operation on the shell *E* would stretch the metal so that fracture would occur.

The shell is drawn to the finished outside diameter in as few operations as possible, and this outside diameter maintained in all

succeeding operations. This is necessary because the inside and outside surfaces of the shell are involved in the thickening of the metal at certain points, as explained later.

Design of the Coning Die

In Fig. 3 is shown the assembled coning die for the first wall-thickening operation which gives the shell the form shown at *F*, Fig. 2. The length, diameter of the base, thickness of the base, and size of the pilot hole of these dies should be standardized as far as possible. By adopting standard sizes or dimensions, the various plugs, pilots, dies, retaining rings and coning rings can be made interchangeable. This permits the dies to be set up for each succeeding operation without removing the die-shoe or punch-holder from the press.

The end *e* of the pilot shown in Fig. 3 shapes the inside of the shell *F*. By having the pilot tapered at the end, the inside of the small end of the shell will also be tapered and the walls can, of course, be made thicker at any point simply by giving the end of the pilot the required shape.

The views *A* and *B*, Fig. 4, show two of the innumerable shapes or designs given the inside of a shell by using pilots of the required shape. The coning dies must be so designed that they form a path along which the metal will flow easily, especially in the case of the first and second coning operations.

Referring to Fig. 3, it is obvious that the shell *F* is supported on shoulder *f* of the plug and that the retaining ring is a snug fit on the outside of the shell. The shell is thus completely encased before the coning die and the pilot come in contact with the small end.

When the coning die continues its downward stroke, the metal can do only one thing—that is, "flow" within itself so that it fills the space between the pilot and coning die, thus thickening the walls (the metal is actually *pushed* up). The dies are used on an ordinary punch press having sufficient power for the job. The press is run at about the same speed as for an ordinary drawing operation.

Speed of Press is an Important Factor

The metal must be given time to "flow" properly in either coning or drawing operations. With reference to the subject of metal flow, it is well known that an attempt to draw a shell by using a quickly delivered blow with a drop-hammer will cause the end of the shell to be punched out. The same result is obtained when a punch press is run at too high a speed.

Frequently, considerable time and stock are wasted in attempting to prevent fracture of the shells by changing the die, when the trouble is not caused by the die, but is the result of running the press too fast. When the speed is too high, the metal is not allowed sufficient time to change from the flat to the formed shape. If the corners of the shell crack frequently, the press should be slowed up.

A good illustration of what is meant by giving the metal time to flow is to place a piece of drill rod in a vise and form it to a right angle while the metal is cold. This can be done if the bend is made slowly, but if an attempt is made to bend the rod by a suddenly applied force, it will snap off. Therefore, it is well to remember that, in using drawing dies and particularly coning dies, care should be taken to see that the speed of the press is such that the metal will be given a chance to flow. The part shown in view *C*, Fig. 4, has walls 0.156 inch thick, but the blank for this part was only 0.125 inch thick. One reason for not making this part from 0.156-inch stock was that a blank of this thickness and of such a small diameter could be formed to the required shape only by applying a tremendous amount of power. The application of so much power at the first operation would stretch the shell, as shown at *a*, view *E*, Fig. 4. This stretching of the shell would produce a finished part having walls thinned as shown at *b*, view *D*.

Although there may be a slight reduction in the thickness of the stock, as shown in view *E*, when using material only 0.125 inch thick, this thinning of the stock can be remedied when the walls of the part are thickened to 0.156 inch by the use of a coning die.

* * *

THE OBJECT OF A CUTTING LUBRICANT

By WILLIAM L. AMBLER

Why do we use a cutting lubricant? When we examine a chip from a cut with 1/16 inch feed, we find that it is apparently much thicker than 1/16 inch and that it has innumerable small cracks on the inside of the curve of the chip similar to the creases on the inside of the palm of the hand when closed. This means that the particles of metal must flow one against the other, and it is in lubricating these particles that the cutting compound is valuable.

When the chip is being bent, a great amount of heat is generated through the friction of the particles of metal slipping on one another. This is where the advantage of a compound made from a soluble oil and water comes in. The water carries away the heat and at the same time cools the concave side of the chip and causes it to contract, thus helping to reduce the pressure on the tool. I have seen the chip curl clear of the tool when cooled or lubricated; I have also seen the chip cut a decided groove back of the cutting edge when no lubricant was used.

If this is true of the action of a cutting fluid, why can we not use a plain mineral oil, which is much cheaper? Because the hydro-carbon oils have very little power to penetrate into the minute crevices of the material. The animal oils have much greater penetrating power, and when the chip bends, the particles sliding one on the other are lubricated much better than by any of the other cutting oils used.

Crankshaft Milling in an Aircraft Plant

By Limiting the Idle Time Between Cuts and by Using Fixtures of Interchangeable Design, Milling Efficiency can be Greatly Increased

THE production in most aircraft engine plants does not warrant the same expenditure for equipment that is justified in an automobile plant; nevertheless, a satisfactory output may be obtained by using tools of interchangeable design in conjunction with standard type machines. The milling operations on the crankshafts of the Lycoming aircraft engine furnish an example of the application of this idea. The operations described are performed on Cincinnati Duplex milling machines.

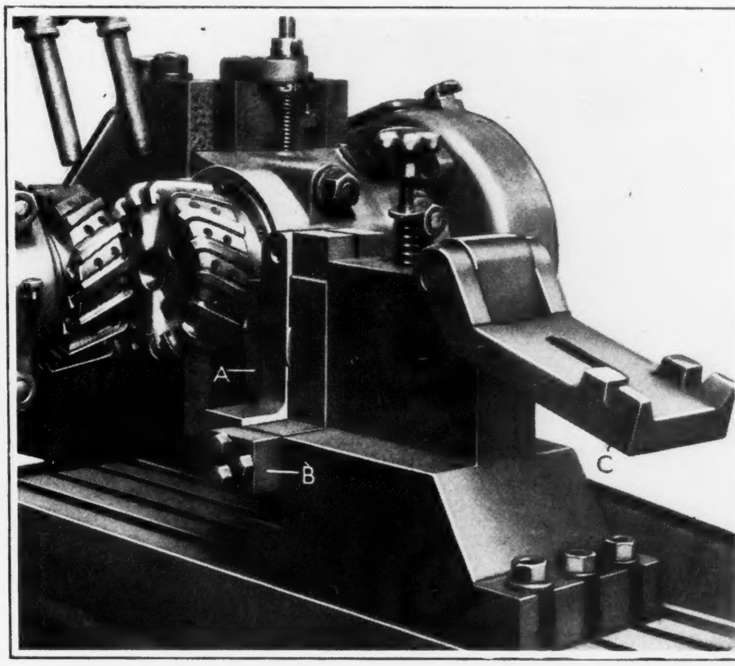


Fig. 1. A Fixture Used for Three Milling Operations

The crankshafts are made from steel forgings in two parts, termed the front crankshaft and the rear crankshaft, respectively. The front crankshaft has an extension to which the propeller is secured.

One Fixture Employed for Three Milling Operations

Both edges of the rear crank cheek, Fig. 2, are milled simultaneously in the fixture shown in Fig. 1. Strap *A* holds the part in the fixture, while its protruding boss centers it by entering a bushing in the fixture. The cheek is located in a vertical position by the stop-block *B*. The illustration shows the set-up for milling the edges of the work. The two ends of the counterweight, however, are milled first in the same fixture. For this operation, stop-block *B* is removed and the work is located vertically by the vees in the swing strap *C* clamped by a hand knob. The same fixture is also used for sawing the slot in the upper crankpin hole and straddle-milling the bolt bosses.

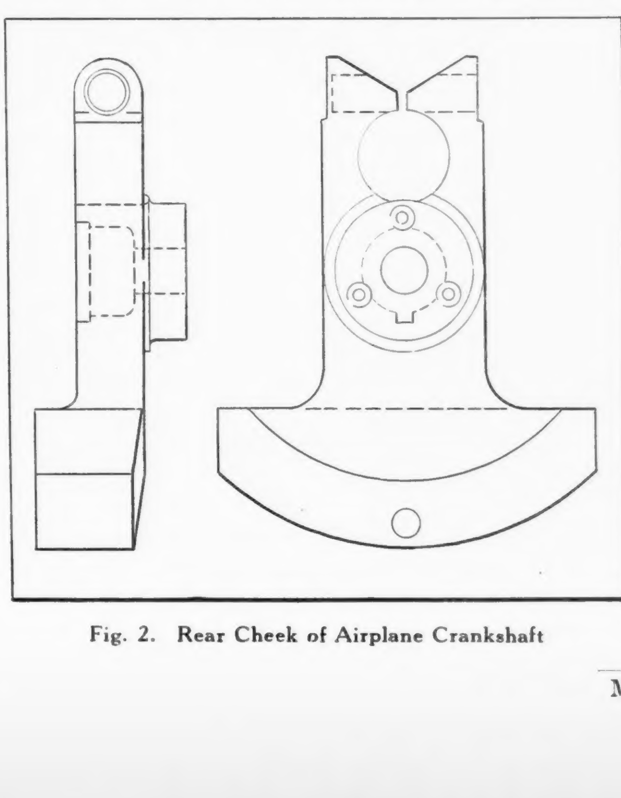


Fig. 2. Rear Cheek of Airplane Crankshaft

The Application of Interchangeable Clamping Means

Two surfaces are milled simultaneously in the fixture shown in Fig. 3. One rear cheek is fastened to the left of the fixture, where the half-round surface at the top is milled by a formed cutter. Another cheek is clamped at the front of the fixture for milling the angular slot. The protruding bosses on the work enter bushings in the fixture to center the cheeks. Stop-blocks fastened to the fixture on each side of the work locate it in a vertical position. The clamping is effected by a bolt at the center and two small clamps bearing against the outer face of each counterweight.

The feed used in milling the half-round surface and the angle is 2 inches per minute, and the time per piece is 4.5 minutes for roughing and the same for finishing. Approximately 1/8 inch of stock is removed. An entire lot of parts is first rough-milled and then placed in the fixture again for the finishing cut.

The same fixture is used for rough- and finish-milling the two front faces of the cheeks, as shown in Fig. 4. An interchangeable clamping arrangement holds the cheeks opposite each other in this operation. Blocks at each end serve as nests for the work. These blocks are keyed and bolted to the main block between them, as indicated in the illustration. The time per piece is 6.5 minutes for roughing and the same for finishing.

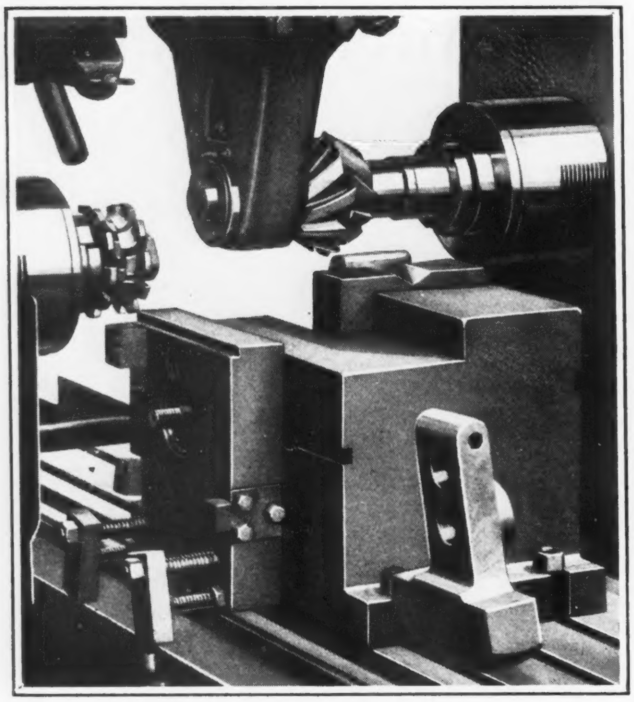


Fig. 3. Fixture for Simultaneously Milling Round End and V-Notch in Rear Crank Cheeks

A Fixture for Rapid Loading

The milling operation shown in Fig. 5 is performed in a machine of the hydromatic type. The over-arms of both heads are used for supporting the cutters and arbors. A 25-degree angle and an arc on the pin end of an entire lot of front crankshaft cheeks are first rough-milled and later finish-milled in the same fixture. The latter is so designed that half of the curvature and one angle is milled on each of two cheeks during one pass of the cutter; then their positions are reversed and the other half milled.

The work is supported by locating blocks and clamped by two pilot wheels at each corner of the fixture. Stops provided in one of the V-blocks take the cutter thrust and locate the crank cheek endwise. Other stops at the front of the fixture locate the part radially in relation to the cutters. The feed is 2 inches per minute; the time for milling one piece is 3.75 minutes for roughing and the same for finishing; approximately 1/8 inch of stock is removed.

In the illustration, rough forgings of the crank cheeks are shown; but in actual manufacturing practice, the main bearing is turned previous to the milling operation. The rapid loading feature of this fixture is at once apparent; it is only necessary to release two pilot wheels in order to remove the work.

Fixture for Four Separate Operations

An economical type of fixture is shown in Fig. 6. This fixture is used for four different operations on the front crankshaft cheek; it is only necessary to change the locating blocks for each set-up. The same machine as is shown in Fig. 5 is used, but only one milling head is required. The work is located by its shaft on two V-blocks. It is held in position radially by interchangeable stops attached to the right-hand end of the fixture, and endwise by means of a stop at the end of the shaft. A forked clamp holds it securely.

In the first of the four operations mentioned, both sides of the counterweight are milled in one pass of the cutters. The production per hour is 9 1/2 pieces. In the second set-up, the face of the counterweight parallel with the center line of the shaft is finish- milled; a production of 11 1/2 pieces per hour is obtained. In the third set-up, the 30-degree flat on the large end is rough-milled, the production being 19 pieces per hour. In the final set-up, the 30-degree flat is finish-milled, the production being the same as for roughing, or 19 pieces per hour.

Fig. 4. Milling the Front Faces of the Rear Crank Cheek in the Fixture Shown in Fig. 3

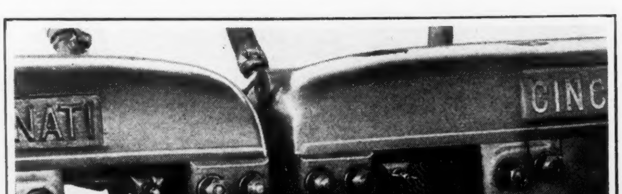


Fig. 5. Milling a 25-degree Angle and Half the Arc on the Pin End of the Front Crank Cheek

Another Example of Fixtures of Interchangeable Design

A fixture with interchangeable locating stops used for more than one operation is shown in Figs. 7 and 8. This fixture is employed for rough-milling the crankshaft to the required length and for milling the back edge of the counterweight. It is also used for roughing and finishing both sides of the counterweight and for finish-milling the front end of the crankshaft.

In Fig. 7, the work is supported by V-blocks and located endwise by adjustable stops; other stops locate the work radially. A forked clamp holds the work in the fixture. The time required for milling one piece is 4.5 minutes.

Both sides of the front crank cheek are rough- and finish-milled as shown in Fig. 8. The fixture is later used for finish-milling the rear end of the crankshaft, this being the last operation on the piece. For milling the sides of the cheek, the bearing end is supported in vees, while the back of the counterweight section rests on studs serving as stops for locating the cheek. Blocks secured to the side of the fixture locate the counterweight section radially. Approximately 1/4 inch of stock is removed in this operation; the time per piece is 5.7 minutes.

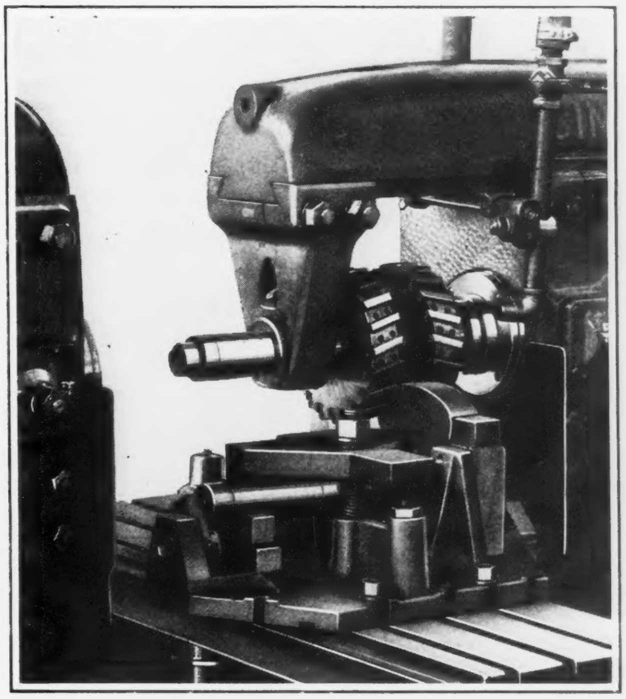


Fig. 6. Fixture Used for Four Separate Operations

* * *

SPRING MANUFACTURERS' ASSOCIATION

A number of the manufacturers of mechanical springs recently met in Toledo, Ohio, and organized an association that will be known as the Spring Research Bureau. The object of the organization is to bring about closer cooperation between manufacturers of mechanical springs, to promote good-will between manufacturers and their customers, to study cost accounting systems and the costs of manufacture, to improve and develop methods in the manufacturing and marketing of springs, to collect and distribute information on operation and on sales problems, and to cooperate with the government departments and other organizations in standardization work. Over thirty manufacturers have taken part in the organization meetings, some of which were held previous to the final meeting in Toledo. The sentiment in favor of the organization was practically unanimous. Malcolm Baird, 232 Delaware Ave., Buffalo, N. Y., is acting as secretary of the organization.

* * *

The longest air mail-passenger line in this country, the Chicago-San Francisco route, carried 38,500,000 letters during the first six months of this year, representing an increase of 6,000,000 letters over the same period last year.

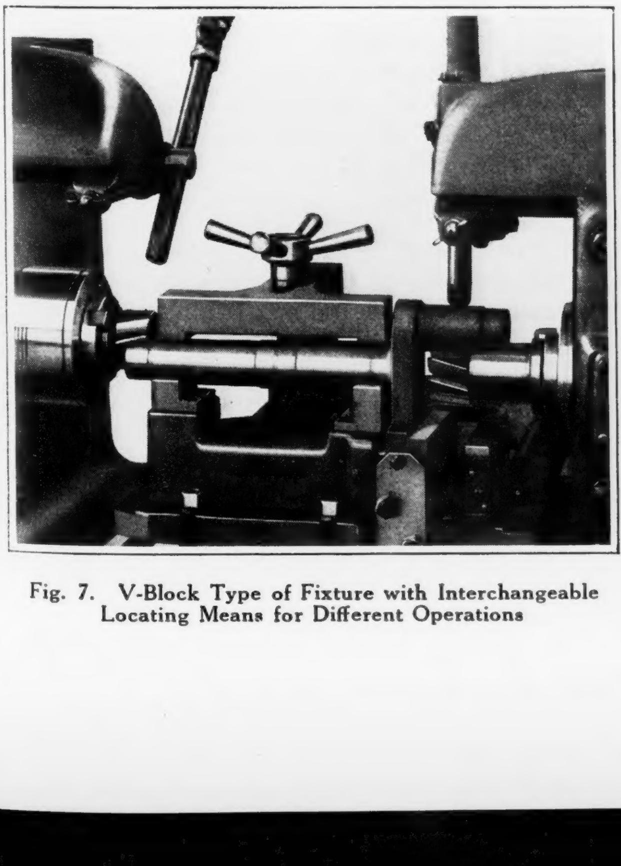


Fig. 7. V-Block Type of Fixture with Interchangeable Locating Means for Different Operations

Fig. 8. Straddle-milling the Edges of the Rear Crank Cheek in the Fixture Shown in Fig. 7

The Shop Executive and His Job

Superintendents and Foremen are Invited to Exchange Ideas on Problems of Shop Management and Employe Relations

WHO SHOULD CHECK DRAWINGS?

I believe it to be inadvisable to put into practice the methods advocated in the article "Reducing the Cost of Checking Drawings" on page 957 of August MACHINERY. During many years of drafting-room experience I have still to find a draftsman who makes a perfect drawing. Almost always some improvements can be made, even if of minor importance, when the drawing is checked by someone else. It is true that an experienced draftsman may be so dependable that his drawings do not require checking; but, nevertheless, I would not advocate this procedure. When a drawing involves close tolerances, moving parts, or the design of members for strength, no matter how experienced the draftsman may be, his drawings should be thoroughly checked by someone who has never seen the drawing before. One slight error in a dimension on parts manufactured on a production basis will cost several times more to correct than the cost involved in checking.

MORTON SCHWAM

THE FOREMAN AS A LEADER OF MEN

Norris A. Brisco, in his book "Economics of Business," says, "Men who know how to get maximum results out of machines are common, but men who know how to get cooperation and the greatest efficiency from the human element in industry are rare." The most difficult duty of the foreman, therefore, is to be the real leader of his men. He must always remember that he represents the company to the men in the shop. He is their boss, and in some cases the only boss they know; hence, he is personally responsible for keeping the men satisfied. To do this he must cultivate tact, patience, and impartiality.

He must have the confidence of his men, as otherwise many problems will appear difficult to solve. When production is lagging, the employes often know the cause when the foreman does not. When the finished product is being rejected in large quantities, the employes may know the reason when the inspector is mystified. When there is lack of cooperation between the management and the employes, the trouble is often due to the fact that the foreman does not fully meet the requirements of his job.

If a man is dissatisfied and quits, the foreman should always acquaint himself with the real cause, and if the fault be his, he should have the courage to assume the responsibility and correct the trouble. The foreman alone is sometimes responsible for a large labor turnover in his department.

A. H. RODRICK

ONCE MORE—THE PUNCTUALITY BONUS

What is punctuality anyway? Let us consider a typical plant where the whistle blows five minutes before starting time and where the men are allowed five minutes to wash up before quitting. Invariably the men are all washed up and ready to leave when the whistle blows. That being the case, is it not fair that the men should have put on their working clothes and have their tools ready, so that they can start work right on time?

Is a man punctual when he reaches the shop and rings the clock right at starting time and then takes at least five minutes to get ready to start work? Or, should he be considered late if he is not ready to start work right on time? Is a man paid for merely being present or for working faithfully during the working hours? Paying a bonus for punctuality looks to me like paying a man a bonus for not stealing any of the firm's property—for, actually, the working hours are the property of the employer.

R. M. HARDING

The concern with which the writer is connected in the capacity of assistant plant superintendent employs from 300 to 350 men. Employes are required to be ready for work when the whistle blows and to remain until the quitting signal. The time-clocks are so located in each department that the time is registered close to the point of the employe's work. When late, the employe is "docked" fifteen minutes for any fraction of that period, and thirty minutes if over fifteen minutes late. We do not pay a bonus for being on time, but we recognize it by publishing a record of punctuality in each department on a bulletin board. Those who have a perfect record of attendance and punctuality for one year get two weeks' vacation with pay, and those who have a 95 per cent record get one week's vacation with pay.

C. H. WILLEY

The discussion of a punctuality bonus seems to have had reference to shop workers only, but some firms include the office force. In one plant, if an employe has been on time for a whole year, he receives $50 in cash. The condition is severe, however, for the employe must be on time and never absent, no matter what the cause. Only a very small number of the employes pay any attention to the scheme, because the conditions are well nigh impossible. This year, out of a staff of sixty, three won the award; only one received it last year.

To make a bonus practicable, the worker must have a sporting chance to win and the chance must

recur with sufficient frequency to keep up the interest, so that punctuality becomes a habit. The period for a perfect score should not be more than three months, the bonus, of course, being proportionately smaller; then there should be a small extra incentive to those who have a perfect record for a full year. A friendly rivalry between departments could be stimulated by bulletin boards.

NON-COMPETITOR

To encourage punctuality by a bonus seems to the writer to be in the same class as the practice of tipping for services that are already paid for. When a workman enters the employ of a company, he should understand that certain definite hours out of each day belong to his employer, and he should be at his designated place of duty during those hours. If punctuality is considered worth special compensation, why not add a little to the workman's wage and then insist that he live up to the rules? To pay a man a bonus for something that is plainly a part of his regular duty is not desirable.

There are cases where it may be good judgment to overlook tardiness. I know of a shop where there is a man who is exceptionally clever at doing odd jobs of blacksmithing, tool dressing, bolt threading, and all kinds of repairs. Whatever work is given him, no matter how impossible it may seem to do it with the tools at hand, will usually be done successfully. He cooperates with everybody in the shop, but he is nearly always from three to fifteen minutes late in the morning—and the superintendent doesn't bother about it.

PAUL HOMER WHITE

WHAT A FOREMAN SHOULD KNOW ABOUT COSTS

I fully agree with the author of the article on page 848 of July MACHINERY. In the highly competitive markets of today it is no longer feasible to manufacture a new product and then establish a selling price on the basis of its cost. The procedure is rather the reverse—competition establishes a selling price and the manufacturer must produce at a cost that will assure a fair profit. The foreman who doesn't know costs, but just turns out the best possible product of which he is capable, may be a drawback to an organization.

A proper appreciation of costs will also curb a foreman's enthusiasm for special machines that may increase the overhead to an unreasonable degree. The use of standard machines may be a true economy in the long run. EARL L. FAIRALL

HOW TO HANDLE THE CARELESS WORKMAN

Carelessness is one of the most aggravating problems confronting the foreman or superintendent. Sometimes, however, what may appear to be negligence may be found, upon investigation, to be due entirely to ignorance, or lack of instruction. The remedy is obvious. Thorough instruction should be given to men who have not had previous training in certain lines of work.

When carelessness is not a matter of ignorance, it is well to try to find the underlying cause. Sometimes the man is working under a nervous tension for the time being, due to illness, death, or other misfortune in the family. Understanding of these conditions will help to tide a good man over such a period of stress and save him for the organization.

G. U. N.

WHAT CLOSE TOLERANCES COST

In a local shop, a shaft was being made with a tolerance of 0.003 inch when a tolerance of 0.010 inch would have served the purpose just as well; but the drawing called for a closer limit and the inspector made the lathe operator live up to it. One day the need for the close tolerance was questioned and the practice corrected. By increasing the limits, a saving of $300 per year was made on this one operation.

Consider the tens of thousands of parts that are made in quantity, with too close tolerances all over the country, and then consider that from $100 to $1000 a year might be saved in the manufacture of every one of these parts if correct tolerances were specified! It is a subject well worth looking into. CHARLES R. WHITEHOUSE

SELECTING NEW EQUIPMENT

When you are buying new equipment, do you ask for assistance from the men in the shop? Their knowledge of the actual requirements for the work to be performed is often useful. Be careful, however, to segregate facts from prejudice, because often a shop man endorses strongly a certain machine, chiefly because he knows that particular machine well from experience, and is afraid to try something new.

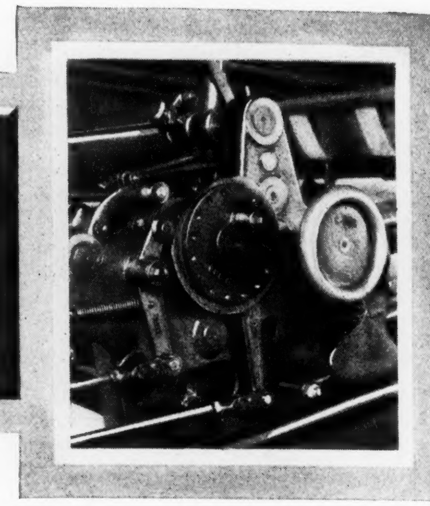
Also, there is a tendency on the part of the shop men to recommend the most complete type of machine in any given line, which often leads to the purchase of a more expensive machine than is required for the kind of work to be done.

The plant superintendent should have the final say under all circumstances, and he should be careful to give every department equal consideration; otherwise, a department with an aggressive foreman, who continually claims that he could do better if he had the "right" equipment, will get more than his share of the expenditures for new machines.

The plant superintendent can also guard against too much special equipment. All too frequently machines have been bought that save time on a certain operation, but there is not enough work in the shop to keep them busy, and a more universal machine would have been more advantageous.

GEORGE H. GUNN

Ingenious Mechanical Movements



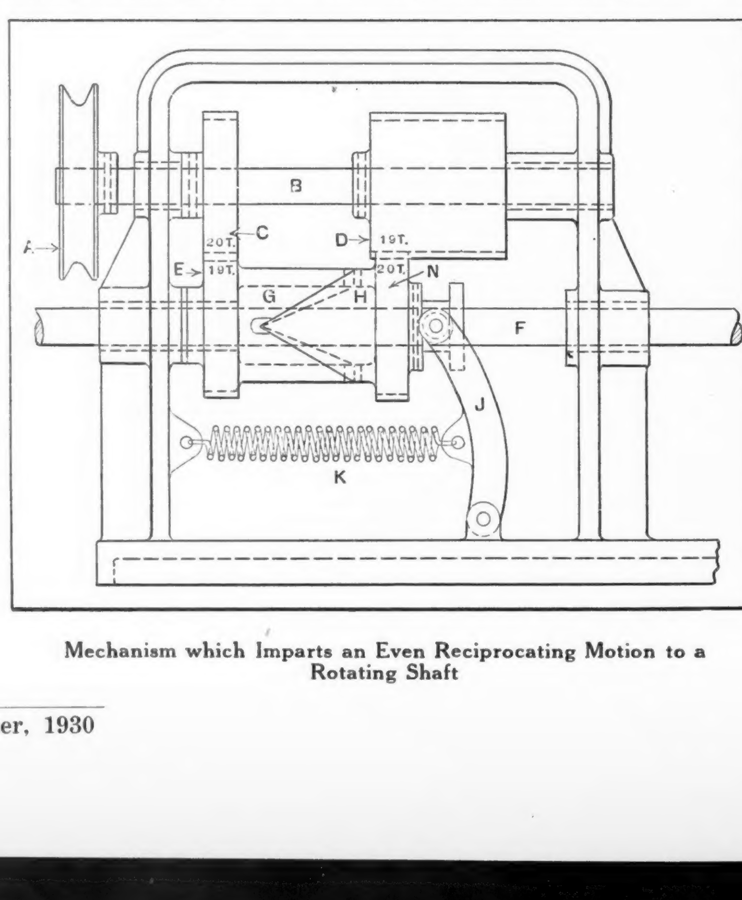
UNIFORM RECIPROCATING MOTION

By B. F. CLARK

A uniform reciprocating motion often is required in machine design, and the mechanism to be described produces such a movement. A belt drive to pulley *A* rotates shaft *B*, which drives gears *C* and *D*. Gear *C* meshes with and drives gear *E*. Cam *G* is integral with gear *E* and is opposed to the mating cam *H*, which is integral with gear *N*. Cam *H* and gear *N* are attached to shaft *F*, which rotates and also receives a reciprocating motion. Cam *G* and gear *E* are free to revolve around this shaft.

Gear *C* has twenty teeth, and gear *E* nineteen teeth, whereas gear *D*, which drives gear *N*, has nineteen teeth, and gear *N* has twenty teeth; consequently, gear *E* and cam *G* are driven somewhat faster than the mating cam *H* and gear *N*, so that there is a differential motion between the two. The result is that cam *G* forces cam *H* and shaft *F* to the right at a constant speed until the point of the driven cam passes the point of the driving cam, when the return stroke begins.

It will be noted that spring *K*, acting through lever *J*, holds cam *H* in contact with cam *G* during the return movement. Gear *D* is made wide enough to permit gear *N* to continue in mesh during the entire stroke. This mechanism, with more or less modification to suit the purpose, could be applied to various classes of machinery.



Mechanism which Imparts an Even Reciprocating Motion to a Rotating Shaft

SKIMMER FOR GALVANIZING VESSEL

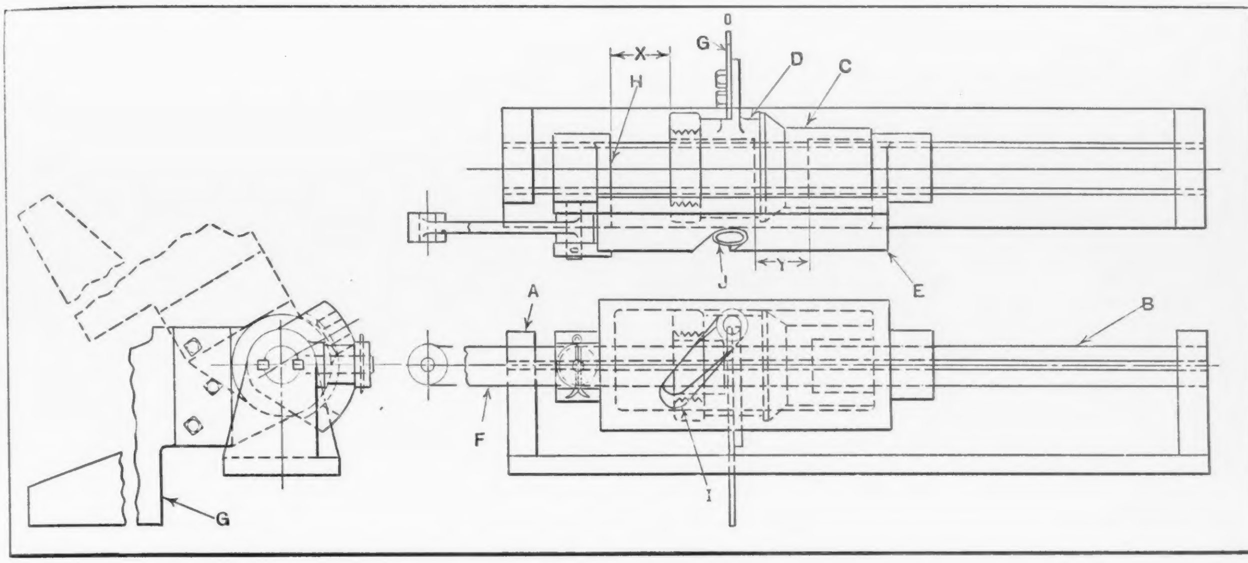
By M. L. HUNKER

The device here illustrated is used for skimming dirt and oxides from the surface of molten lead in a galvanizing vessel. Pieces to be galvanized are dipped in this vessel, and in order that they shall have a smooth and bright surface, all foreign matter must be removed from the lead before the pieces are withdrawn.

The skimming is done by means of the reciprocating blade *G*. The blade is in contact with the lead on the stroke from right to left. The return stroke, however, is made with the blade in an elevated position, as shown in the end view. With the blade in the latter position, the pieces to be coated can be readily placed in or withdrawn from the vessel.

On the bracket *A*, secured to the side of the vessel, is fastened a stationary shaft *B*. Sliding on this shaft is a sleeve *C* which, in turn, forms a bearing for the bushing *D*. On one side of this bushing is an extension to which the skimmer is fastened, while on the other side is mounted a cam roller *J* which engages an angular slot in the carriage *E*. The carriage slides on shaft *B*, and is given a reciprocating motion by a crank (not shown) through the connecting-rod *F*. Both members *C* and *E* are prevented from rotating by keys in shaft *B*.

Referring to the plan view of the illustration, it will be seen that the skimmer blade is at



Combined Reciprocating and Elevating Movement Applied to Skimmer on Galvanizing Vessel

its farthest position to the left. The carriage E now moves toward the right, and after traveling a distance X, the surface H on the carriage boss comes in contact with the end of the sleeve C. While the distance X is traversed by the carriage, the sleeve C is stationary and the roll J is forced downward due to the angularity of the cam slot I. This movement of the roll will cause the blade G to rise above the molten lead.

The carriage E continues to move to the right with the blade in its elevated position until the end of the stroke is reached. On the return of the carriage, the gap shown at X will be on the other end of the sleeve C. As the width of this gap decreases, the cam roll will ride to the top of the slot I, causing blade G to enter slightly past the surface of the lead. The blade, held in this position, skims the surface of the lead as it continues its stroke to the position shown in the plan view.

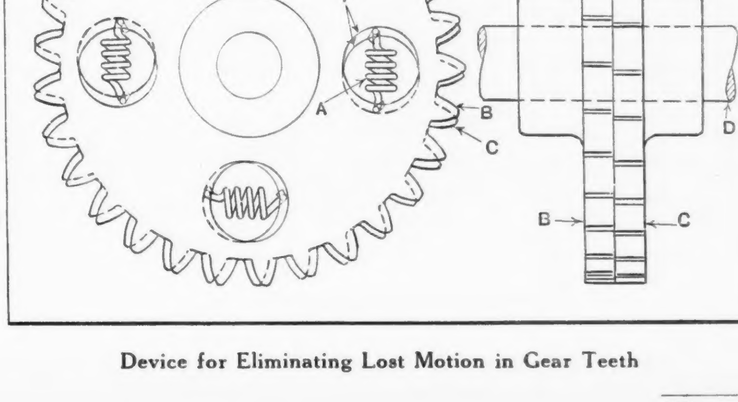
There must be sufficient friction between the shaft and the sleeve so that the latter will remain stationary while the roll J raises the skimmer blade. This friction is obtained by counterboring both ends of the sleeve until the length of its bearing on the shaft is shortened to a distance Y. The location of this short bearing surface is such as to cramp the sleeve enough to obtain the desired friction. In this simple way, a very effective and dependable frictional grip is obtained.

DEVICE FOR ELIMINATING LOST MOTION IN GEAR TEETH

By JOHN E. MORSE

In devices where gears are used, such as those operating graduated dials, it is often desirable to eliminate all lost motion resulting from wear occurring between the gear teeth. The gears shown in the illustration impart motion to a dial indicator that must register in both a clockwise and a counter-clockwise direction. It is obvious that any play in the teeth of the gears would produce inaccuracies in the dial readings.

The driving gear E meshes with both the gears B and C, the latter being fastened to the shaft D. In both gears B and C, are drilled holes F for the springs A. One end of each spring is secured to gear B and the other end to gear C. The thickness of the teeth in both these gears is less than that of the driving gear E, so that normally, there would be considerable play between the meshing teeth. However, owing to the tension of the springs A the teeth in gear C are advanced ahead of those in gear B and serve to fill the tooth spaces in the driving gear. In this way, as wear occurs, it is obvious that all lost motion in the gear transmission is eliminated, and that no matter in which direction the gears are run, there will be no play between the teeth nor inaccuracy in the dial readings.



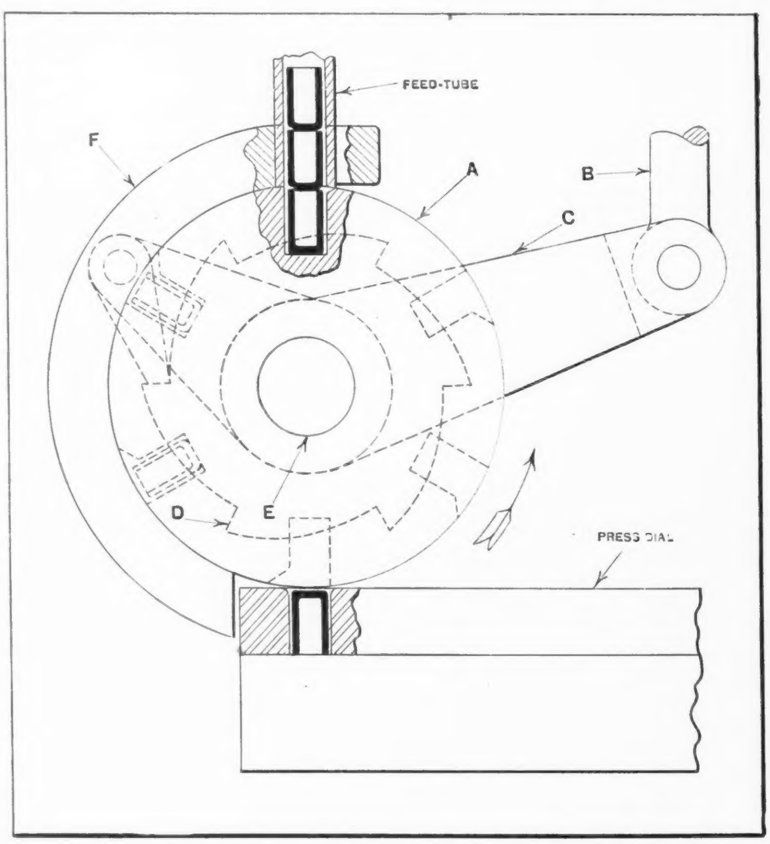
Device for Eliminating Lost Motion in Gear Teeth

INVERTING SHELLS AFTER THEY LEAVE THE HOPPER

By J. E. FENNO

Some hoppers used for feeding shells to power presses are designed so that the closed end of the shell will enter the feed-tube first. To permit this type of hopper to be used for work in which the shells are required to enter the press dial with the closed ends at the top, some means must be provided for inverting the shells after they leave the hopper and before they enter the dials.

This may be done by employing the device shown in the illustration. Here it will be seen that the shells leave the hopper tube and drop into recesses in the disk *A*. These recesses are equally spaced and the disk is indexed one space for every cycle of the press. The indexing occurs during the upward stroke of the ram. Motion is transmitted to the disk for this purpose by means of the link *B* and the lever *C*. At one end of lever *C* is mounted a pawl which engages the ratchet wheel *D*. The ratchet turns freely on the shaft *E* and transmits the required rotary motion to the disk *A* by means of friction washers (not shown).



Simple Device for Inverting Shells before they Enter the Dial Press

In the position shown, a shell has just entered the top depression in the disk, with its closed end at the bottom, while at the lower part of the disk another shell has dropped into the press dial with its closed end at the top. The principle employed here is obvious, only one-half revolution of the disk *A* being required to invert each shell. The stationary guard *F* provides for retaining the shells in the disk.

It will also be noted that one corner of each of the impressions in the disks is beveled. This is done so that as this corner passes the hopper feed-tube it will not jam the shell in the end of the tube, but will force it upward into the tube.

In case the stroke of the press is such as to cause the disk to be indexed more than one division, the link *B* can be equipped with a coil spring acting against the connecting member of the press ram, and a stop can be provided for lever *C*, so that the latter will oscillate only the required amount.

Incidentally, the device illustrated may be used in connection with the type of hopper described on page 625 of April MACHINERY.

It may also be added here that the friction drive for the disk *A* provides a means for stopping the disk automatically in case of jamming when defective shells are fed through, in which case the guard *F* should be made removable, so that the shell can be extracted. After the shell is extracted, the disk must be rotated by hand until it assumes the correct position relative to the ratchet wheel. Corresponding lines scribed on both of these members may be employed for this purpose.

It is evident that this arrangement may also be used for feeding shells into the dial with their closed ends at the bottom, provided, of course, that they leave the hopper tube with their closed ends at the top.

* * *

On October 6 a memorial to George Westinghouse, the well-known inventor and founder of the industries that bear his name, will be dedicated at Schenley Park, Pittsburgh, Pa. The ceremony will include the unveiling of a bronze group, of heroic proportions, designed by Daniel Chester French, one of America's foremost sculptors. Leaders in industry, science, art, and education will be present to pay tribute to the memory of a great engineer. The main unit of the memorial rises 20 feet from a Norwegian granite base. It includes a dominating figure of Mr. Westinghouse with two figures, one on each side, depicting a skilled workman and an engineer. Facing this group on a separate pedestal is a figure of American youth studying the monument of achievement.

* * *

The National Automobile Chamber of Commerce announces that the total August production for the automobile industry in the United States and Canada was approximately 240,000 cars and trucks. This is 53 per cent below the record production of August a year ago, and 12 per cent less than the production for July this year. The production for the first eight months was 2,843,000.

ELECTRIC DROP PIT TABLE FOR LOCOMOTIVE REPAIRS

Drop pit tables in locomotive shops facilitate the removal and replacement of driving-wheel sets and front and trailer trucks. For such service, the Shaw Crane Works of Manning, Maxwell & Moore, Inc., 100 E. 42nd St., New York City, have developed the electric table here illustrated.

This table is intended for installation in a pit as illustrated in Fig. 2, the table top being equipped with rail sections which align with tracks on the shop floor when the table is in the upper position. Thus, locomotives can be run on the table and after the pair of wheels to be removed has been disconnected, the table is lowered into the pit as illustrated in Fig. 1. The entire table can then be rolled from under the locomotive, the table raised, and the wheels rolled out on the shop floor.

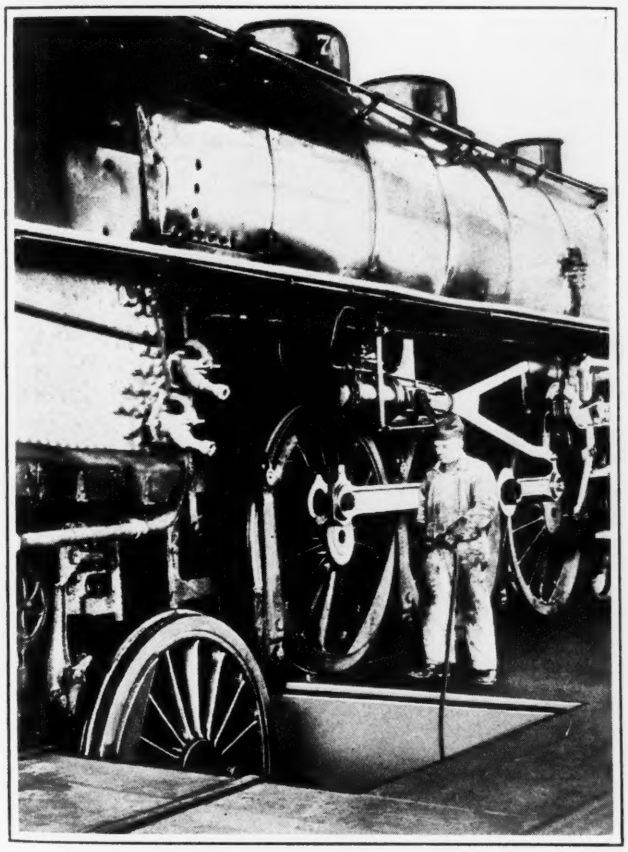


Fig. 1. Removing a Set of Locomotive Driving Wheels by Means of an Electric Drop Pit Table

This electric drop pit table is made in standard capacities of 30 and 50 tons and in movable and stationary types. It consists of three principal parts—the truck, the lifting table, and the table top. The truck is an all-steel carriage with four H-beam columns for supporting and guiding the table. The chilled iron wheels on which the truck runs along the pit rails are roller-bearing equipped. The lifting table unit comprises an electric motor, an automatic magnetic brake, limit stops, gearing, and four hoisting drums which are double-flanged for flat wire rope. The table top is a heavy structural frame having locking bars.

DRAFTING-ROOM EFFICIENCY CAN BE INCREASED

The editorial "Drafting Room Efficiency can be Increased," on page 770 of June MACHINERY refers to an important subject. In addition to the causes of waste of time mentioned, it might be well also to call attention to the waste in drawing both halves of a symmetrical design; developing a new idea in complete detail, step by step, without first sketching out the idea as a whole; showing three views when two are equally clear; the use of shade lines, except on drawings that are made largely for appearance; and the use of fancy lettering (plain straight lettering is more legible anyway). Furthermore, the draftsman will waste the time of the shop if he does not indicate tolerance and finish clearly on the drawing.

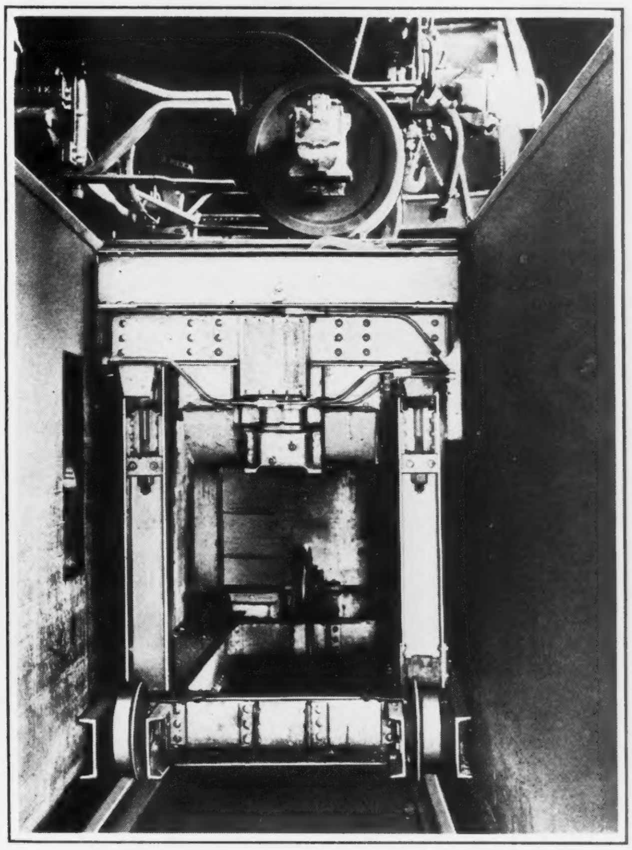


Fig. 2. The Electric Drop Pit Table is Designed on the Principle of an Elevator and Also Runs on Tracks

A good drawing should have only enough lines on it to make the idea clear to the shop. All else is superfluous. CHARLES KLYNE

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ELECTRICAL STANDARDIZATION

A number of new standards for generators, motors, and switch gear were approved by the Standards Committee of the National Electrical Manufacturers Association, 420 Lexington Ave., New York City, at a recent meeting. Among other subjects, these new standards cover planer type motors, crane motors, and drip-proof fully protected motors.

Current Editorial Comment

In the Machine-building and Kindred Industries

SHOULD PRODUCTION BE GUARANTEED?

Many manufacturers of production equipment have found it inadvisable to guarantee the output of their machines. It is possible to give a production estimate, but when production is definitely guaranteed, difficulties are likely to arise.

No one can guarantee performance unless he controls all the conditions surrounding that performance; and no manufacturer of shop equipment and tools controls the conditions in his customer's shop. Castings may come hard; they may run out; there may be too much stock left to be removed; the cutting tools used may not be of the best quality; the finish required may vary according to the ideas of an inspector; the machine operators are not all alike—some men are better workers than others; and there are many other conditions that are beyond the control of the machine builder.

All that the machine builder can consistently do is to estimate that under certain conditions of speed, feed, and quality of material, it will take a certain length of time to finish one piece, including the set-up time. With this information, the customer, knowing his material and the conditions in his plant, can determine for himself what his output per hour or day will be.

* * *

DESIGNERS MUST KNOW WHAT TO DESIGN

Frequently new designs of machinery are developed that function exceptionally well in the shop of the builder but that do not meet with the anticipated approval when they are placed in the customer's shop. Very often this is due to the fact that the designer has not had the opportunity of studying thoroughly the shop conditions in the type of plant in which the machine is to be used. He has drawn merely upon his general mechanical and engineering knowledge in making the design.

Designers of machinery in general, and particularly those who design shop equipment for high-production shops, should make a close study of the conditions under which the machines are to be used. It is important, for example, that the designer should have an opportunity to acquaint himself with the type of labor that is to operate the machine; if it is to be in the hands of comparatively unskilled labor, it is necessary to make its operation as fool-proof as possible.

Factory inspection trips, such as are conducted in connection with conventions and engineering society meetings, are not sufficient for making the proper study of conditions. The designer should be sent to the customer's plant as a special visitor, with an introduction to some official who will give him an opportunity to become thoroughly informed about the requirements for machines of the type that he is to design.

* * *

CARE IN SETTING UP NEW MACHINES

Much damage is done by careless handling when unloading and installing new machines. The beds and frames are frequently subjected to heavy strains, thus causing alignment troubles. When the machines are lifted, chains and ropes are often applied in the wrong places, setting up undue bending and twisting strains. Sometimes the machines are moved around the shop in a careless manner. In one instance, new machines were placed on a heavy steel sheet to which a truck-tractor was attached, and were then moved across the yard and through the shop. Even rugged machine tools are too delicate to be handled in that manner.

After being installed, many machines are injured by inexperienced operators, ignorant of the proper care of shop equipment. In one case when a machine gave trouble, it was discovered that the automatic oiling equipment had not been filled with oil for several months. As the operator had not been instructed, he assumed that since the oiling system was automatic, it did not require attention.

Great care is needed in the installation of new machines, and operators should be properly instructed how to take care of them.

* * *

THE FOREMAN COMES TO THE FRONT

The foreman of a manufacturing department is never in the limelight; yet, as manufacturing plants grow larger and the distance between management and workmen increases, the foreman becomes more and more responsible for the success of an industrial enterprise. He is virtually the manager of his department and is the chief link between the corporation management and the workers. If the men are loyal to the firm, it is largely because the foreman is loyal and knows how to instill loyalty and enthusiasm in his men.

Managers of industrial enterprises recognize this, and efforts are being made at present to help foremen fit themselves for the more exacting duties that they are expected to perform. Foremen training courses and foremen conferences are established practice in industry today. It is being realized more and more that the foreman should not be merely a highly skilled man in his trade—he must be a real manager and leader of men.

A Workable Bonus Plan for Tool Draftsmen

A Successful Bonus Plan of Payment has been Applied in the Tool Designing Department of the White Motor Co.

IT is generally believed that the bonus system of payment cannot be applied in the tool designing department. However, the White Motor Co., Cleveland, Ohio, has used this plan of payment in the tool designing department for several years and has found it advantageous to do so.

Under this system the tool designing department is so organized that one tool designer is assigned to a squad of five or more tool draftsmen. The tool designer makes free-hand sketches of the tools to be designed, and after they have been approved by his immediate superior — the tool-design chief — they are handed to the draftsman who executes the actual drawing in detail.

In this way, the tool draftsman is given a fairly definite task to perform and he need not spend his time trying to guess what kind of tool his chief would like him to draw for a given operation. He may suggest improvements, of course, if such occur to him during the actual drawing of the tool, and he is expected to incorporate standard provisions for efficient equipment which are not included in the rough sketch that the tool designer hands him; but the actual design is not made by him.

Again the impossible in shop management has been done. It has always been stated that the bonus system of payment could not be applied to a tool designing department. It was believed that the requirements in tool designing and tool drafting were such that no possible plan could be devised to estimate the time that would reasonably be required for making a design and drawing; and, hence, to compensate tool designers and tool draftsmen by a bonus plan would not be feasible. For several years past, however, the White Motor Co. has applied the bonus payment plan successfully in its tool designing department. The efficiency of the department has been greatly improved and the earnings of both the tool designers and tool draftsmen have been increased.

The "Standard Time" is Determined after the Drawing is Completed

A "standard-time" curve, based on a thorough time study, and covering drawings of varying size and "density" has been set up, and, on the completion of a drawing, its size and density are calculated in accordance with certain well defined rules. Briefly, this calculation is based on the aggregate length of the sides of a rectangle that completely circumscribes the picture of the tool on the drawing, and on the number of what are known as "contact points" involved in the design. By "contact points" are meant each point on the drawing where, for example, a screw, dowel, or jig leaf is in contact with the jig body or some other part of the tool.

The aggregate length of the rectangle circumscribing the tool drawing and the number of contact points are multiplied together, and the product gives a number which may be located on the standard time curve and from which the number of hours allowed to make the drawing is determined. After this is done, the bonus payment is determined in accordance with the differential bonus plan.

The system of bonus payment has been extended to include not only the tool draftsmen, but also the tool designer. The latter receives a bonus based on the efficiency of the tool draftsmen in his charge. The rates of these bonuses would have to be determined by each plant in accordance with its own requirements. Suffice it to say that at the White Motor Co.'s plant the earnings of both tool designers and tool draftsmen have increased materially since the introduction of the bonus system about four years ago. The amount of work turned out in a given time is much greater. It has been found that tool draftsmen employed on day work, with no definite incentive to production, are not much more than 30 per cent efficient, as compared with first-class tool draftsmen employed on the bonus plan. This provides a real reason for the system.

Owing to the policy of withholding wage incentives from inspection and checking, no attempt has been made to apply the bonus plan to the tool design checkers, and the amount of checking necessary still bears the same proportion to department output as before the incentive was applied to the drafting.

The bonus plan, as briefly outlined here, has proved satisfactory in that it makes it possible to give a special reward to the rapid and accurate worker. It makes it possible to pay for tool design work on the basis not merely of the time spent in doing the work, but also in accordance with actual performance. In order to make the plan effective, however, it is necessary that the preliminary planning of the tools be very carefully done.

* * *

AIRCRAFT PRODUCTION IN 1929

The Bureau of Census has just published its figures pertaining to aircraft production in 1929. In that year there were 117 plants in the United States engaged primarily in the manufacture of aircraft and parts. The total value of the finished product was close to $62,000,000, or about three times the value in 1927, the next previous year for which complete statistics are available. Nearly 10,000 people were engaged in the industry, as compared with 4400 in 1927. The total number of airplanes built was 5130, in addition to 176 seaplanes and amphibians.

Fig. 1. Melting Pots from which Molten Metal is Conveyed to Permanent Mold Casting Machines by Hand Ladles

Permanent Mold Casting of Aluminum Alloys

Methods and Equipment Employed in Producing Permanent Mold Castings at the Monarch Aluminum Ware Co.'s Plant

By J. B. NEALEY

PRESENT-DAY practice in producing castings from aluminum and other alloys is divided into three principal methods, known as sand-casting, permanent mold casting, and die-casting. With the permanent mold method, a somewhat wider range of alloys can be used than with the die-casting method, because in the case of permanent molds, the hot metal is poured by gravity, whereas in die-casting, it is forced into the dies under pressure. For this reason, die-casting is practically limited to alloys with melting points ranging up to about 1400 degrees F. If metals having a higher melting point are used, the dies will deteriorate too rapidly under the pressure required.

The alloys most generally used with the die-casting method are those having either aluminum, zinc, tin, or lead bases. With the permanent mold method, the molds will withstand much higher temperatures, and metals such as copper and brass, which melt in the neighborhood of 2000 degrees F., can be used. There is a sub-division of the permanent mold method, which is called "semi-permanent." In the latter method, sand cores are used with the alloy steel mold.

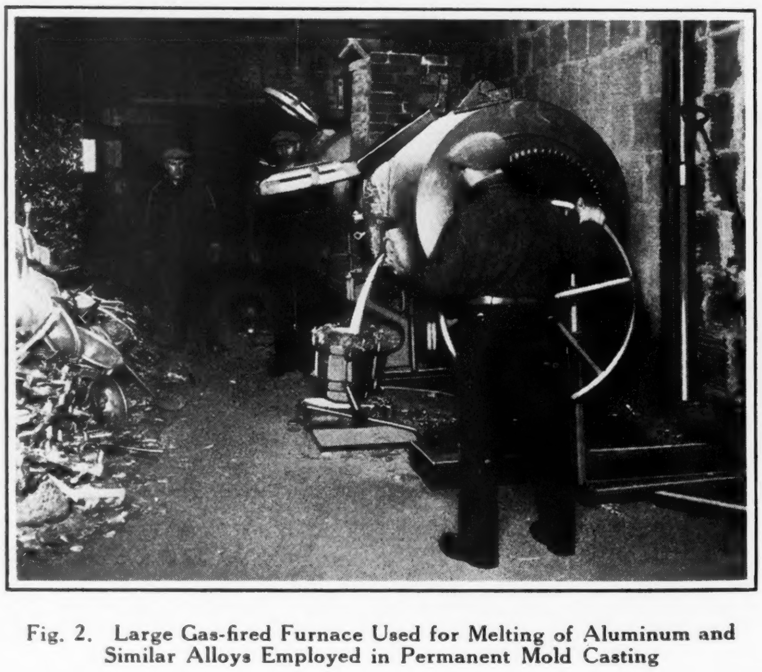

Fig. 2. Large Gas-fired Furnace Used for Melting of Aluminum and Similar Alloys Employed in Permanent Mold Casting

When large numbers of parts are wanted, either the permanent mold or die-casting method is generally employed. The products made by these two methods are much more accurate in size and require much less machining than those produced in sand molds. A higher density is also obtained, when the molds and dies are correctly designed, because the casting draws from the feeders when

shrinking or cooling rather than from the casting itself.

The methods described in this article are employed by the Monarch Aluminum Ware Co., Detroit, Mich., in the production of household cooking utensils, parts for motors, automobiles, airplanes, washing machines, toasters, irons, etc. The method employed most extensively in this plant is permanent mold casting, although sand-casting is used when more economical. There are comparatively few concerns that use the permanent mold method.

Physical Properties of Permanent Mold Castings

Castings having a wide range of physical properties are made by this process. Aluminum alloys are the most widely used for these castings. Aluminum, with small percentages of copper, silicon, iron, magnesium, and tin, produces castings with tensile strengths of from 18,000 to 30,000 pounds per square inch and up to 10 per cent elongation in 2 inches. If heat-treated, the tensile strength of these castings will run between 24,000 and 55,000 pounds per square inch.

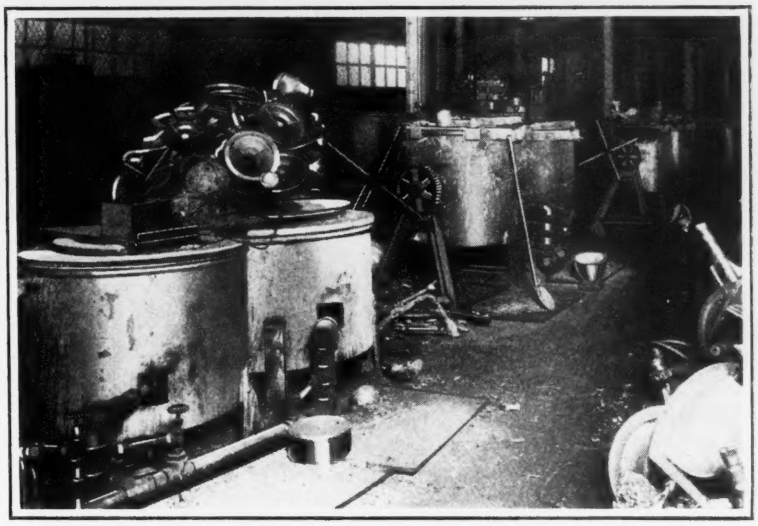

Fig. 3. Group of Melting Furnaces of 300 Pounds Capacity, Employed for General Melting Purposes

One of the most commonly used alloys is one containing 92 per cent aluminum and 8 per cent copper, which, when poured, develops a tensile strength of 18,000 to 20,000 pounds per square inch, a yield point of about 16,000 pounds, and an elongation of from 2 to 3 per cent. Another contains 95 per cent aluminum and 5 per cent silicon, which gives a tensile strength of about 24,000 pounds per square inch, a yield point of 17,000 to 18,000 pounds per square inch, and an elongation of 4.5 per cent. Still another, and one of the toughest alloys, consists of an aluminum base with nickel, magnesium, or manganese. Castings made from such alloys develop tensile strengths ranging from 35,000 to 40,000 pounds per square inch. By slightly varying the percentages of the metals, a wide range of physical characteristics can be obtained.

Material Used for Permanent Molds

Permanent molds are made from semi-steel castings constructed in two or more parts, which, when held together, form the shape of the casting to be made. These parts are held in a mechanical device within a frame which operates through cams, link motions, rack and pinions, etc., to force and clamp them together during the pouring and to pull them apart in order to allow the casting to drop out. The latter action includes drawing out the cores. When a new job is introduced, a whole new machine is built for it. These machines are hand-operated. A typical machine of this type is shown in the lower left-hand corner of Fig. 1.

The practice is to melt the alloys in regular melting furnaces, such as shown in Figs. 2 and 3, and to transfer the molten metal to holding furnaces, or else draw it off into crucibles and pour it directly from these into the molds with hand ladles. Lack of control over the melting and pouring temperatures is the most frequent cause of trouble in making aluminum castings.

Gas is used for melting the metal and for maintaining the required heat in the pots that hold the metal. With this fuel, the temperature can be controlled easily and accurately, and the cost of operating the melting furnaces is claimed to be 30 per cent less than with the heating methods previously employed.

Construction of Melting Furnaces

Several types of melting furnaces are used, the most common being a cylindrical oscillating type, as shown in Fig. 2. This furnace consists of a steel retort lined with refractory material. The furnace chamber or retort is made of steel plate with cast-iron heads, and has a cast-steel collar around the pouring opening. A refractory-lined cast-iron door with a vent is clamped tightly down on the steel collar around the pouring opening when the furnace is in operation.

The retort rests on cast-iron stands bolted to a heavy bedplate, and is revolved on steel rollers by means of a motor-operated worm which engages a worm-wheel secured to the retort. The retort is split longitudinally, hinged at the back, and held together by bolts, so that it can be relined easily. It is heated directly by a gas burner at one end. The melting speed is increased by rotating the furnace through 180 degrees, or nearly to the pouring point, as soon as it is put in operation. It is allowed to remain in this position for fifteen minutes and is then rotated to the opposite side, where it is allowed to remain for a similar period. This oscillating motion is continued until the metal is ready to be drawn off. These furnaces have a capacity of 2000 pounds each.

The holding furnaces shown in Fig. 1, in which the crucibles of molten metal are held, consist of upright steel shells with brick linings. The firing system consists of a single gas burner located at the bottom, the flame impinging on the crucible tangentially. The metal in these crucibles, which are

of 400 pounds capacity each, is maintained at the correct pouring temperature by means of thermocouples and automatic temperature controls.

Annealing and Finishing Methods

Some of the castings are annealed and others are heat-treated, but all pass through the machine shop, where batteries of band saws are employed for removing gates and risers. The final cleaning of the castings is done in a washing machine consisting of a rectangular steel shell equipped with a steel mesh conveyor. A series of nozzles through which hot washing solutions are forced in needle sprays are located in the front part of this machine, while a row of gas burners transforms the latter portion into a drying oven.

Gas-fired furnaces are used for annealing and heat-treating. For removing casting stresses, the parts are heated in an oven to 280 degrees F. and allowed to cool slowly with the oven. The heat-treatment of these castings consists of heating to the required temperatures and quenching in boiling water, cold water, or oil and then aging them in the air. The temperature varies from 920 to 980 degrees F., according to the analysis of the metal.

When quenched, the material is almost as soft as in the annealed state, but increases in hardness and strength—tensile strength and yield point—when allowed to stand at room temperature. While this aging action is rapid at first, it slows down gradually, being completed in from four to ten days. There is little or no loss in elongation, but there is a decided decrease in plasticity. Some alloys require a second heating and quenching to obtain the maximum effects, while others age spontaneously at room temperature. A hot-air blast or steam is sometimes used in the place of water for quenching purposes.

When the material has been brought up to the correct temperature for heat-treating—920 to 980 degrees F.—it must be soaked for periods of time varying from one to twelve hours before quenching. This, of course, varies according to the cross-section of the casting, chemical analysis of the material, and physical properties desired. Here accurate temperature control is essential, for if the heat is too low, the effects desired will not be obtained and if too high, partial melting and burning, together with a loss of strength and ductility, will follow.

The Problem of the Elderly Workman

One of the problems confronting industry is how to take care of the workman who has given long and faithful service, but who is no longer able to keep up with the younger men. Many companies have developed pension plans which are a great help to the older men when they reach the age of retirement, but the Packard Motor Car Co. has evolved a plan that is entirely novel in its features and that was adopted more than four years ago in preference to the many pension plans that were studied by the company's officials. The plan recognizes as a basic principle that older employes are happier working than idle if they are physically able to do so. In applying the plan, no iron-clad rules are followed, but, rather, an attempt is made to handle each man individually according to his needs and personal qualities.

To begin with, a man is not discharged because he has reached a given age. If he begins to fall behind in his work in the production line, he is asked to confer with the employment department. In talking the matter over in a friendly way, it is frequently brought out that medical attention is all that is needed in order to enable him to go back to his old job and fill his accustomed place. Sometimes, however, it is necessary to change his work, so that his duties are less arduous. A suitable job may be found in some other department, or if this is not possible, he may be transferred to a specially organized department where work is provided calling for skilled, semi-skilled, and unskilled employes. Much of this work is of a nature requiring less physical effort than production work.

Perhaps the most interesting feature of the plan is that the man is transferred to the special department at the same hourly rate that he received on his former job. Generally, each man so transferred is past sixty years of age, although exceptions are made when deemed advisable. At the present time, there are seventeen men in this department ranging in age from fifty-nine to eighty-one years. They are all happier working than they would be if retired on a pension. All that is required of each man is simply a fair day's work, considering his age, ability, and physical condition.

As mentioned, the man is transferred to this department at the same hourly rate that he formerly received. However, the department is not charged with the full amount, but only with the value of the work actually performed. The difference is charged to a special expense account—you might call it a pension fund if you wish—so that it is known at all times what it costs to operate the plan.

The Packard Motor Car Co. has made many contributions toward the stabilization of an industry which, in its fluctuations, affects practically every basic industry in the country. This plan of taking care of its older employes is another step in the direction of a rational method of management. The more generally such methods are adopted by industrial plants, the sooner will the critics of the machine age find little to complain about and much to commend. The steps recently taken by the General Electric Co., to provide steady employment and to reduce to a minimum the hardships of periods of slack business are in the same direction.

Increasing Output by Reciprocating Milling

Second of Two Articles Describing Production Jobs on which a Variety of Fixture and Cutter Combinations are Employed Effectively

By FRANK W. CURTIS, Research Engineer, Kearney & Trecker Corporation

THE process known as "reciprocating milling" was defined and illustrated by typical examples in September MACHINERY, page 7. Additional examples, illustrating the application of this method are given in the present article. It always pays to analyze carefully the proposed set-up for any milling operation. If a number of pieces can be milled at one time, the output will naturally be much greater. Even if the number of pieces in each run or lot is such that the set-up has to be changed frequently, the multiple feature represents a distinct gain. The only additional expense is that involved in the construction of the fixture and the cost of additional cutters, which is soon offset by the higher output.

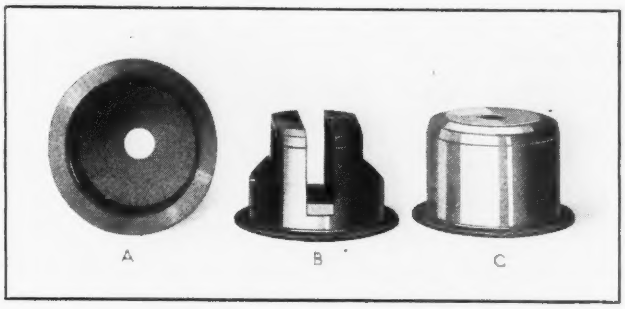

Fig. 6. Drop-forged Cylinder Skirt Milled with Equipment Shown in Fig. 7

At *A* and *C*, Fig. 6, is shown a drop-forged cylinder skirt used in connection with an airplane engine. This cylinder requires to be milled as shown at *B*. The part is previously machined all over, and is then milled with three cutters to produce a slot in the center and cut away sections on each side. This type of cut offers an excellent opportunity for the use of a reciprocating set-up.

In Fig. 7 is shown the arrangement of the cutters and fixtures employed for milling this part. The two fixtures are identical in construction, consisting of cast-iron bodies equipped with adequate locating and clamping members. It is estimated that an increase in production of 65 per cent was obtained in this case by using two fixtures instead of one.

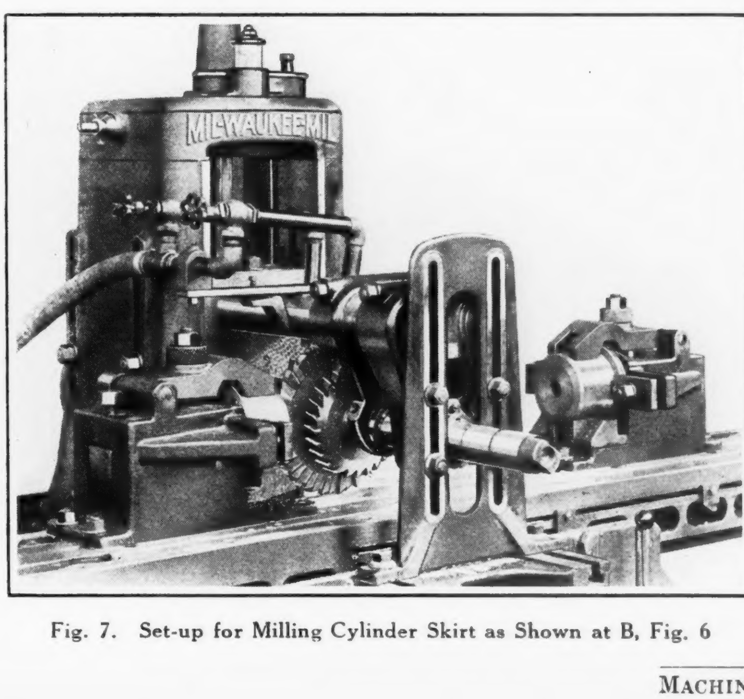

Fig. 7. Set-up for Milling Cylinder Skirt as Shown at B, Fig. 6

The shape of the part is such that the surface directly under the hinged type clamps, which may be seen at the right in Fig. 7, must be supported in order to avoid distortion when the cutters are fed into the work. In Fig. 9 is shown the method of clamping. The work is located on the hardened steel block *A* which is formed to correspond with the outside diameter. The hinged type clamp *B* is swung into place and locked by a C-washer and nut. Directly under this clamp is located the clamp *C*, which is also of the hinged type and is operated by means of the screw *D*. This clamp supports the work from the inside, thus preventing distortion.

The flange of the work is held firmly in place against a hardened plate by the two clamps *E*, one of which is located on each side of the fixture. The details of this fixture are shown in order to bring out the importance of proper support and rigidity. In milling a piece of this type, there is considerable likelihood of vibration being caused by the deflection of the work while cutting. However, with proper clamping and supporting facilities, this danger is eliminated.

Set-up for Milling Pads on Bracket

A vertical set-up for milling pads on a cast-iron bracket is illustrated in Fig. 8. Through the use of the two reciprocating milling fixtures shown in this illustration, the production has been increased 75 per cent over the estimated production attained with a single fixture set-up. The operation consists of facing the top surface of the work which is 4 inches square, about 3/32 inch of metal being removed.

The work is located from a previously drilled hole, and is held securely by vise-jaw clamps operated by a cam handle. The only lost time involved in this

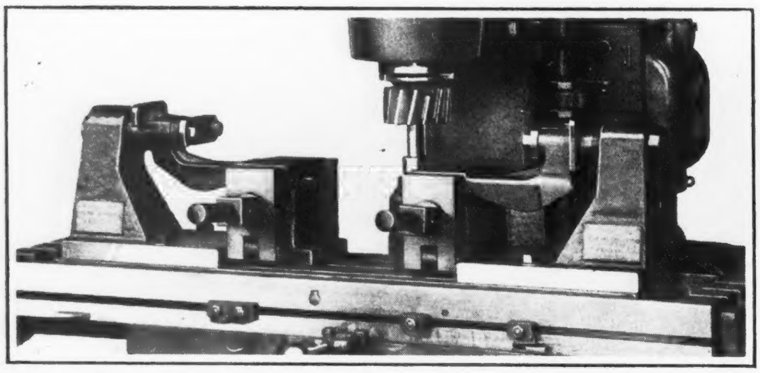

Fig. 8. Vertical-spindle Machine Equipped for Milling Pads on Cast-iron Brackets

operation is the time consumed by the rapid traverse movement in feeding the table from one side to the other, which is approximately 5 seconds. The fixtures are practically identical in construction, the only difference being in the arrangement of the clamps, both of which have the handles located at the front side. The output required is such that the fixtures are only used for eight hours and are then replaced by fixtures for other operations.

Milling Sides of Gate Valves

In Fig. 10 is shown a set-up for milling two sides of cast-iron gate valves at one time, using two fixtures of similar construction. In this case, an estimated production increase of 60 per cent is attained by handling the operation as shown. The width of the cut is 5 inches, the cutters are 6 inches in diameter, and approximately 1/16 inch of metal is removed on the side. This valve, as well as other groups of valves, are run through in short lots so that the machine is used for a total of twenty different operations, all of which are of the reciprocating type. In order to compensate for the various widths of valves to be milled, the cutter-head at the right is made adjustable.

Set-up for Two Different Operations

As previously mentioned, reciprocating milling may also be used advantageously on multiple-spindle machines, and in Fig. 11 such a set-up is shown. The work being milled is a cast-iron pump body used in connection with water system units for home installations. Instead of performing the same operation at both ends of the table, this set-up is arranged with two distinct fixtures, so that two operations are handled during the complete cycle.

In operation, the work is first placed on one side, and machined by straddle milling cutters that face the opposite sides of a projecting boss, and a vertical cutter that faces a top pad. The work is then located in the opposite fixture, where a top and a side pad are faced. The machine is equipped with a special head designed for milling the various surfaces. An outstanding advantage of a lay-out of this type is that there is no accumulation of semi-finished parts waiting for the second operation.

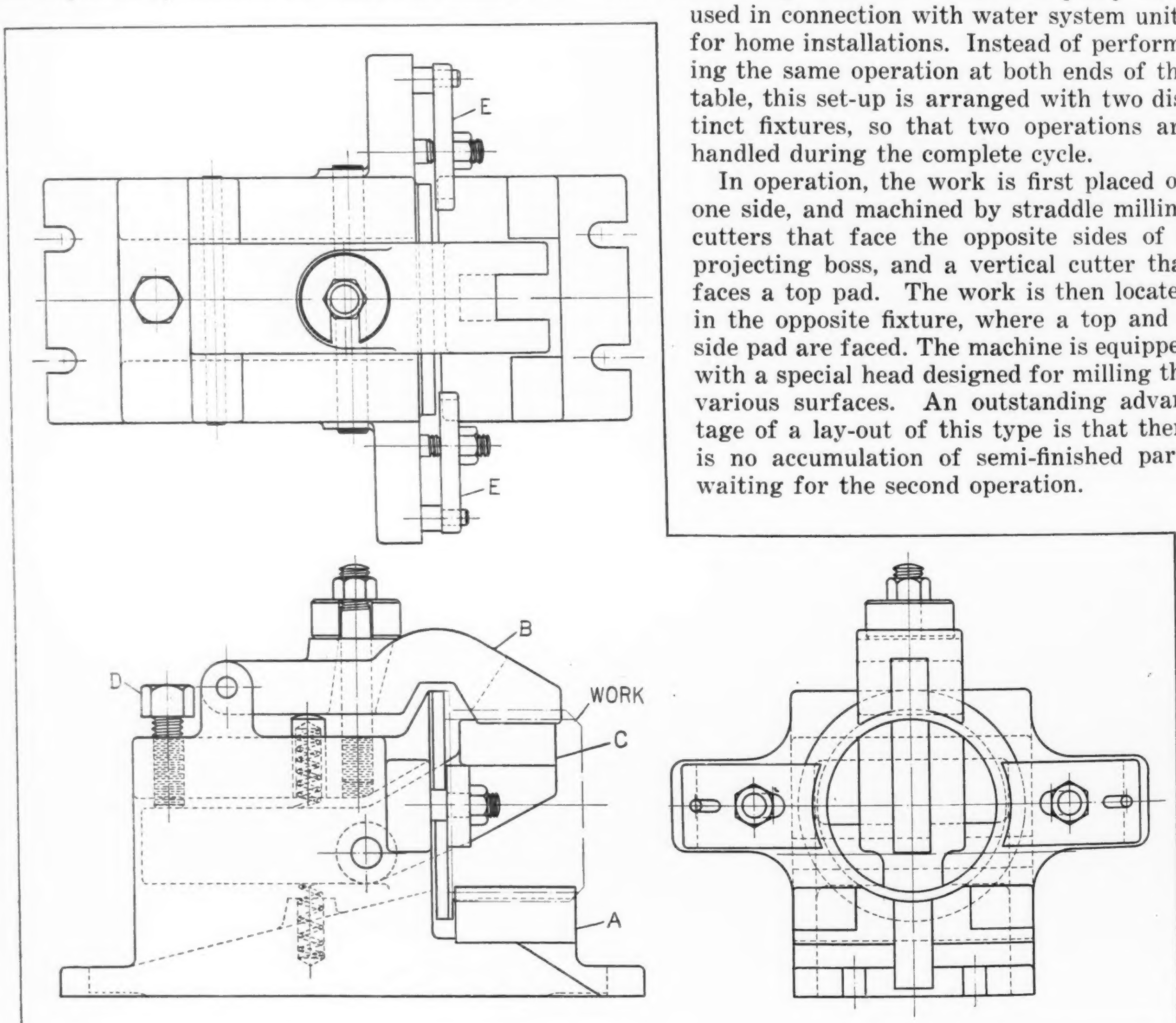

Fig. 9. Assembly Views of Fixtures Shown in Fig. 7

As shown in the illustration, the right-hand fixture is mounted on a tapered sub-base, so that it is possible to maintain the correct cutting height above the table after the cutters have been ground. This adjustment compensates for any variations in the cutters and is an essential feature in set-ups of this type.

A two-spindle machine for rough- and finish-milling bosses of automobile steering spindles is shown in Fig. 12. The spindles are made of alloy steel forgings and have approximately 3/32 inch of metal removed from each side. Two fixtures are used, one on each side of the table, each of which holds two pieces. The fixtures are air-operated and controlled automatically by means of a lever which is engaged during the travel of the table. A production of 325 pieces per hour is obtained, which shows clearly the advantages of this type of milling.

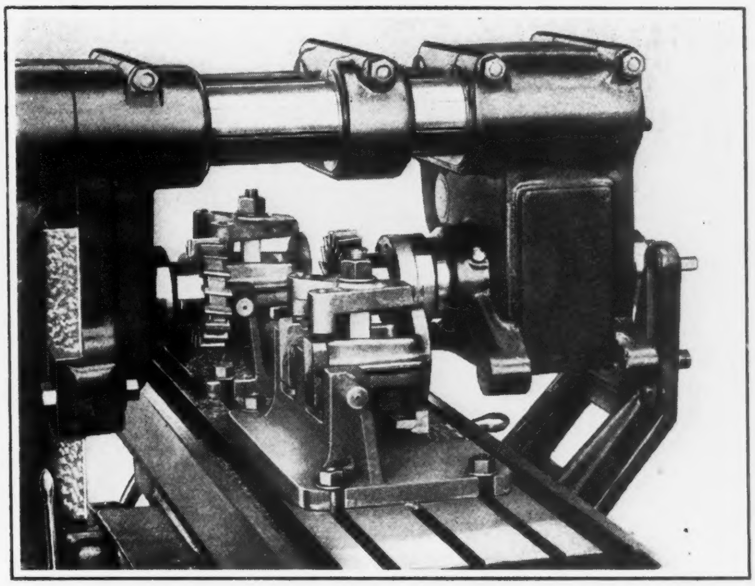

Fig. 10. Milling Two Sides of Cast-iron Gate Valve Bodies by the Use of Two Fixtures

ABRASIVE WHEEL SAFETY CODE

A revised edition of the American Standard Code for the use, care and protection of abrasive wheels has just been approved by the American Standards Association, 29 West 39th St., New York City. Since the original edition of the code was approved in 1926, progress in the grinding wheel industry has made the revised code necessary. In 1926, the maximum speed for the vast majority of grinding wheels was from 6000 to 6500 peripheral feet per minute. The present code provides for maximum speeds varying from 4500 to 16,000 feet per minute, the higher speeds having been made possible by the use of synthetic resin and rubber bonded wheels. The new code also provides for the use of steel castings for hoods for high-speed wheels.

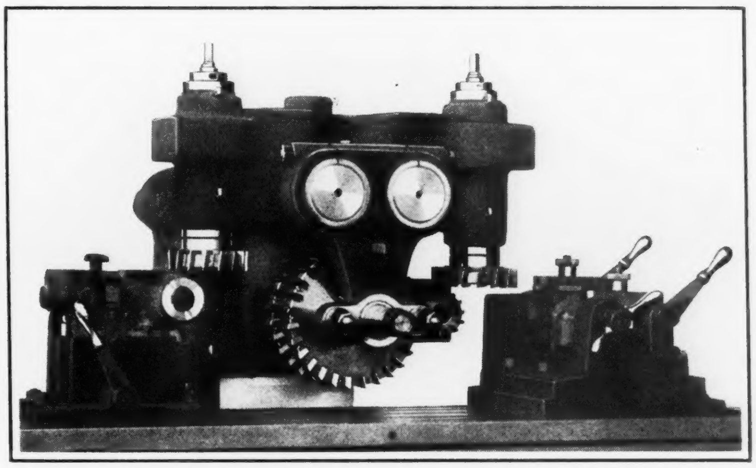

Fig. 11. An Example of Reciprocating Milling on a Multiple-spindle Machine

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Great improvements have been made during recent years in conveyors. Today there are roller-bearing belt-conveyor idlers in use that require less than half the power of the idlers formerly used. They last much longer and need to be lubricated only twice a year instead of every day. Cut gears operate silently in oil in dustproof housings; the chains for chain conveyors are made of heat-treated alloy steel with casehardened pins and bushings which could not have been obtained at any price a few years ago. The durability of conveying equipment has been greatly increased and the maintenance cost very much reduced.

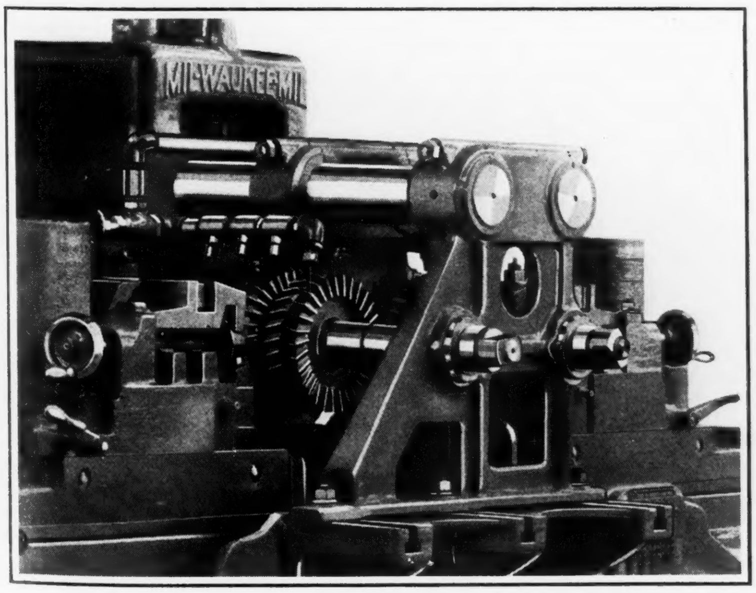


Fig. 12. Two-spindle Set-up for Rough- and Finish-milling Bosses on Automobile Steering Spindles

Nitriding or Casehardening with Ammonia*

Methods Employed in Nitriding to Produce Parts that Have a Tough Inner Core and Surfaces with Outstanding Wear-resisting Qualities

By V. O. HOMERBERG and J. P. WALSTED, Cambridge, Mass.

THE process of casehardening by means of ammonia, called "nitriding," is remarkable for its simplicity. The parts to be hardened are placed in a heated furnace, subjected to the action of ammonia gas for a definite time, and then removed. The articles, as they come from the furnace, are hard and require no further treatment. This is a distinct advantage over the older casehardening methods.

The ammonia used in the process is the commercial anhydrous material commonly used in refrigeration. The ammonia, on passing over the steel, breaks down to some extent into nitrogen and hydrogen, the nitrogen in the nascent condition readily entering into the steel. The gases passing out of the furnace consist of hydrogen, unabsorbed nitrogen, and undissociated ammonia. The exit ammonia may be conducted to the outdoors or dissolved in water and drained into the sewer. As these gases are the only waste products, the problem of waste disposal is very simple.

Advantages of the Nitriding Process

The temperature of nitriding is low compared to that of other heat-treating processes. This allows the parts to be heat-treated before nitriding without danger of subsequent destruction of desirable physical properties. Nitriding leaves a clean surface free from scale. This is a great advantage, especially as the heat-treating precedes the nitriding. Thus, parts coming from the nitriding furnace are ready for service. Moreover, the low temperature required for nitriding removes all danger of warpage during casehardening, provided all strains have been previously removed.

The hardness obtained by nitriding is remarkable. The resistance to corrosion shown by nitrided steels is also an advantage. Nitriding, while it does not solve the problem of corrosion, does eliminate this difficulty in many instances.

Kinds of Steel that Can be Nitrided

A series of alloy steels containing varying amounts of carbon, together with approximately 1 to 1.25 per cent aluminum, 1.5 per cent chromium, and 0.2 per cent molybdenum, are now being manufactured for nitriding purposes. Alloy steels having this particular combination of alloying elements show the maximum surface hardness when exposed to ammonia gas. Furthermore, this hardness is retained at high temperatures and the nitrided specimens show a marked resistance to atmospheric, water, and salt-water corrosion. These steels are marketed in several grades under the name of "Nitralloy." The presence of molybdenum tends to toughen both the core and the case resulting from the ammonia treatment. These steels have high shock-resisting properties and, hence, possess qualities valuable in many applications in the design of machine parts, aside from those that adapt them for nitriding.

The equipment required for the casehardening of articles with ammonia consists of a furnace provided with automatic temperature control; an air-tight container (which should be made of a material not susceptible to ammonia hardening) for holding the articles to be nitrided; a tank of ammonia provided with a needle valve for controlling the flow of the gas; and a special pipette for determining the extent of the ammonia dissociation.

Special furnaces for nitriding are now being made by a number of furnace manufacturers. Some of these furnaces are provided with a fan for insuring active gas circulation. The ammonia gas decomposes to a certain extent into nitrogen and hydrogen. The nitrogen, which is very active at the moment of decomposition of the ammonia gas, undoubtedly combines to a certain extent with the iron and with the alloying elements in the steel to form nitrides. These nitrides are very likely in a fine state of dispersion in the case and impart extreme hardness to the surface of the steel, a hardness which gradually decreases inwardly until it corresponds to that of the core.

Temperature Required and Time of Exposure

The time of exposure of the articles to the action of the ammonia gas at the nitriding temperature varies from 2 to 90 hours, depending on the service to which the nitrided parts are to be subjected. No heat-treatment is given to the parts after nitriding, the articles being cooled in the box, usually to room temperature. The nitriding temperature generally varies from 900 to 1000 degrees F., 975 degrees F. being commonly used.

The necessity for the complete removal of strains set up in forging, machining, and hardening in order to prevent warping or distortion during nitriding, has been emphasized. Straightening of parts after nitriding may be required if this precaution is not observed. This is especially likely to occur in thin flat sections or in parts having a large diameter at one end and a long section with a smaller diameter at the other end, such as spindles, pump plungers, etc. It has been found possible to straighten such parts even when done cold. Since the hardness of the case is not affected at 1000 degrees F., it is obvious that the straighten-

*Abstract of a paper presented before the National Machine Shop Practice Meeting of the American Society of Mechanical Engineers in Chicago, Ill., September 22-24.

ing operation can be well applied to the hot material.

Great emphasis should be given to the necessity for the complete removal of the decarburized layer before nitriding. If this precaution is not observed, the nitrided case will chip and flake. Sufficient material must be left for final machining or grinding before nitriding to insure the complete removal of all traces of decarburization resulting from the forging and the heat-treating operations.

Heat-treating Parts to be Nitrided

A typical procedure to follow in the case of an article machined from an annealed bar is to rough-machine, heat-treat, finish-machine, and then nitride. The heat-treatment involves quenching in oil from the proper hardening temperature followed by tempering at a temperature which is at least as high as that used in nitriding, in order to obtain proper physical properties for the core and to relieve machining and hardening strains. Sufficient time should be allowed for this operation in order to prevent warping or distortion in nitriding, which is the last operation, except for a possible finishing operation, such as lapping.

Effect of Temperature on the Results of Nitriding

As an example of the effect of the nitriding temperature on the results obtained, it may be mentioned that Nitralloy G when nitrided 48 hours at 975 degrees F. has a depth of case much less than when nitrided for the same period at 1200 degrees F. However, a marked decrease in the hardness accompanies this increase in case depth. In order to take advantage of the greater case depth obtained at a higher temperature and of the greater hardness when nitrided at the lower temperature, a double cycle of treatments is frequently advocated. By this plan, the parts are nitrided for a suitable length of time at 1200 degrees F., followed by a period at a temperature of 975 degrees F. Reversing this procedure has also been recommended in some cases to produce a tougher case than when using a temperature of only 975 degrees F. When the latter plan is employed, the work is exposed to a temperature of 1200 degrees F. for only a short period.

The temperature at which articles are nitrided has a considerable influence upon the results obtained. As an example, it may be mentioned that certain parts nitrided for forty-eight hours at 975 degrees F., had a depth of case much thinner than when nitrided for the same period of time at 1200 degrees F.; but, while a deeper case was obtained at the higher temperature, the hardness of the case was less, so that what was gained in one direction was lost in another. However, it is possible to obtain both the greater depth of case resulting from the higher temperature and the greater hardness resulting from the lower temperature, by nitriding the parts first at the high and then at the low temperature.

Growth of Metal Objects Resulting from Nitriding

A slight growth of the metal takes place during the nitriding process. In the case of some cylinders made from Nitralloy G, the increase in length ranged from 0.001 inch when nitrided at a temperature of 900 degrees F., to 0.003 inch when nitrided at 1000 degrees F. The corresponding increase in diameter ranged from 0.0003 inch to 0.0011 inch. In this case, the cylinders had been previously oil quenched from 1650 degrees F. and tempered at 1000 degrees F. for 4 hours, followed by nitriding at the temperatures mentioned for a period of 48 hours. Prior to nitriding, these cylinders were ground accurately to a length of 5.816 inches and a diameter of 0.710 inch.

This growth can be allowed for in the final machining or grinding before nitriding, or it can be removed afterward by lapping. Advantage of this growth can be taken in the case of gages, where their usefulness will be destroyed as soon as a slight wear has taken place. The re-nitriding of such articles, especially at a higher temperature, will produce sufficient growth to make them useful again.

Since a certain amount of growth takes place on nitriding, sharp corners should be avoided. In the case of a cylinder, the growth in length, together with the growth in diameter, will combine to push the edge outward. This edge will be very brittle and will chip quite readily. Well-rounded corners and generous fillets should be used whenever possible on parts that are to be nitrided.

The growth is dependent upon the amount of nitrogen introduced, and, therefore, upon the case depth. It is independent of the size of the article. A step-down cylinder, nitrided at 975 degrees F. for 48 hours, showed the same growth in the smallest section, which was 1/2 inch in diameter, as in the largest section, which measured 2 inches in diameter.

It frequently happens that threaded portions or other areas must be protected so that they will not become surface hardened. Nickel plating gives satisfactory results; tin or solder may be used, provided that certain precautions are taken. Only that amount of tin which can be retained by surface tension should be present in order to prevent particles of molten metal from dropping on the articles at a lower level in the nitriding box and thus producing protection where not wanted. The authors are using a paint of tin oxide mixed with glycerin. The glycerin is an excellent vehicle and decomposes into volatile compounds during the nitriding process, so that the tin oxide can be readily reduced to metallic tin by the active hydrogen which is produced as a result of the decomposition of the ammonia.

Hardness and Wear Resistance of Nitrided Surfaces

The hardness of nitrided articles cannot be accurately determined by the usual hardness testing devices. Any chipping of the case will give an erroneous reading.

Since there is no universal wear-testing machine nor test methods, the question of wear resistance should be studied under actual service conditions whenever possible. The results obtained in the wear tests of nitrided parts show, however, that the use of nitrided materials in machine parts which are subject to severe wear conditions and are difficult to lubricate offers promising possibilities.

Conclusions

The physical properties of Nitralloy in the unnitrided condition compare very favorably with those exhibited by the best structural alloy steels.

All parts should be heat-treated before nitriding in order to obtain desirable physical properties of the core and to insure proper grain refinement, since the original grain size of the material is not reduced during the nitriding operation.

Nitriding experiments at temperatures ranging from 900 to 1300 degrees F., inclusive, show that the depth of the case increases, but the hardness decreases with an increase in temperature. It is possible to nitride at a relatively high temperature, 1200 degrees F., for example, to obtain considerable depth of case and then to nitride at a lower temperature, such as 950 degrees F., to obtain the desired surface hardness.

The presence of decarburization before nitriding produces a brittle case which is likely to chip. This decarburized layer must be removed before subjecting the parts to the action of the ammonia gas. Strains created by machining and by heat-treating of parts must be relieved if warping or distortion in the finished articles is to be prevented.

Nickel plating and a coating of tin or solder will protect parts against nitriding. A coating of tin oxide in glycerin will also serve as a protective agent.

A slight growth takes place during nitriding. Allowance can be made for this growth in the final machining or grinding operation, before nitriding, or by lapping, after nitriding.

Nitrided articles offer marked resistance to atmospheric, water, and salt-water corrosion. Nitrided Nitralloy exhibits excellent wearing properties, even when tested without lubrication against certain other alloys.

General Electric Co. Meets the Unemployment Problem

The unemployment plan of the General Electric Co., designed to make funds available for employes during times of need or unemployment, has been adopted by a favorable vote of more than 75 per cent of the employes. In proposing this plan, under which the money will be raised by equal contributions from the employes and the company, it was announced that the plan would become effective only upon an affirmative vote of 60 per cent of those participating at each works of the company. The Schenectady, Lynn, Pittsfield, Bridgeport, Bloomfield, Philadelphia, Fort Wayne, and West Lynn plants have already voted to participate in the plan.

Under the arrangement, plans will also be made for stabilizing employment by reducing the causes of unemployment in the company's plants to a minimum. The regulations laid down for this purpose are of great importance to industry as a whole.

What to Do when Business is Good

When business is increasing, the working force is to be increased by adding employes as slowly as possible. Rush work in busy departments is to be taken care of by transfers from other departments. Over-time is to be applied as far as possible before increasing the working force. In busy times, plant renewals and maintenance work are to be postponed, if feasible, all the available men being employed on regular production.

Rules to Follow when Business Begins to Fall off

Then, when work begins to fall off, all hiring is to cease at once. Over-time is to be eliminated and all departments brought down to a normal working week. Men from slack departments are to be transferred to those that are still busy. In every instance possible, men will be used on maintenance and repair work, bringing the plant and equipment up to a high standard in slack times. In extreme cases, instead of men being laid off, the normal working hours will be reduced, as gradually as possible, to 50 per cent of the normal week. The policy will be to use the company's own men, as far as possible, in the construction of increased plant facilities.

When men are to be laid off, single persons with no dependents and new employes with less than a year of service will be laid off first; but not less than one week's notice will always be given. In accordance with the General Electric Co.'s custom, established for some time, employes are also to be told whether they are subject to a temporary lay-off, due to lack of work, or to a permanent loss of employment.

In order to increase the volume of business for the shop, the sales department is to be encouraged to obtain coöperation from customers in placing business for future delivery. Standard apparatus will be built for stock in accordance with established demand for such equipment, and all stocks at the factories and district warehouses are to be brought up to the maximum consistent with safe business policy.

The policy outlined in the foregoing, if applied by all manufacturing establishments, would greatly aid in reducing the evils of unemployment in dull times.

Design of Automatic Die-casting Dies

The Use of Interlocking Cores in Die-casting Dies—A Die for Producing 128 Castings a Minute ·Last of Five Articles

By CHARLES O. HERB

INTERLOCKING cores are the principal feature of the set of die-casting dies illustrated in Fig. 1, which is employed for producing the small eccentric piece shown at *B*, Fig. 2. These interlocking cores, and the ejector-pins as well, are operated automatically by means of mechanism embodied in the movable die. Motion is imparted to this mechanism through stationary cam-blocks attached to a combination bar mounted on top of the Madison-Kipp die-casting machine for which these dies were designed. The locating of the core-operating mechanism in the dies themselves, which is a feature of all the dies made for these machines, reduces the die space to a minimum.

The pieces produced in the dies shown in Fig. 1 are approximately 1 3/8 inches in diameter by 1 1/8 inches long. They are cast from zinc at the rate of sixteen pieces or eight "shots" per minute. Approximately 1,000,000 pieces have been produced from these dies with little wear. The molten metal is forced into the die cavities under a pressure of from 250 to 300 pounds per square inch. In Fig. 3, which illustrates the construction details, it will be seen that the movable and stationary dies meet along line *X*, part *F* being the stationary die. The view at the right in this illustration shows the face of the movable die.

Mechanism for Operating the Interlocking Cores

Lug *C* of the part, as indicated in Fig. 2, is dovetailed and thus requires the use of a core plate *G*, Fig. 3, which must be moved at an angle. When the movable die is advanced toward the stationary die preparatory to an operation, this core must be shifted into the position illustrated before core *H* can be moved through it horizontally to form the

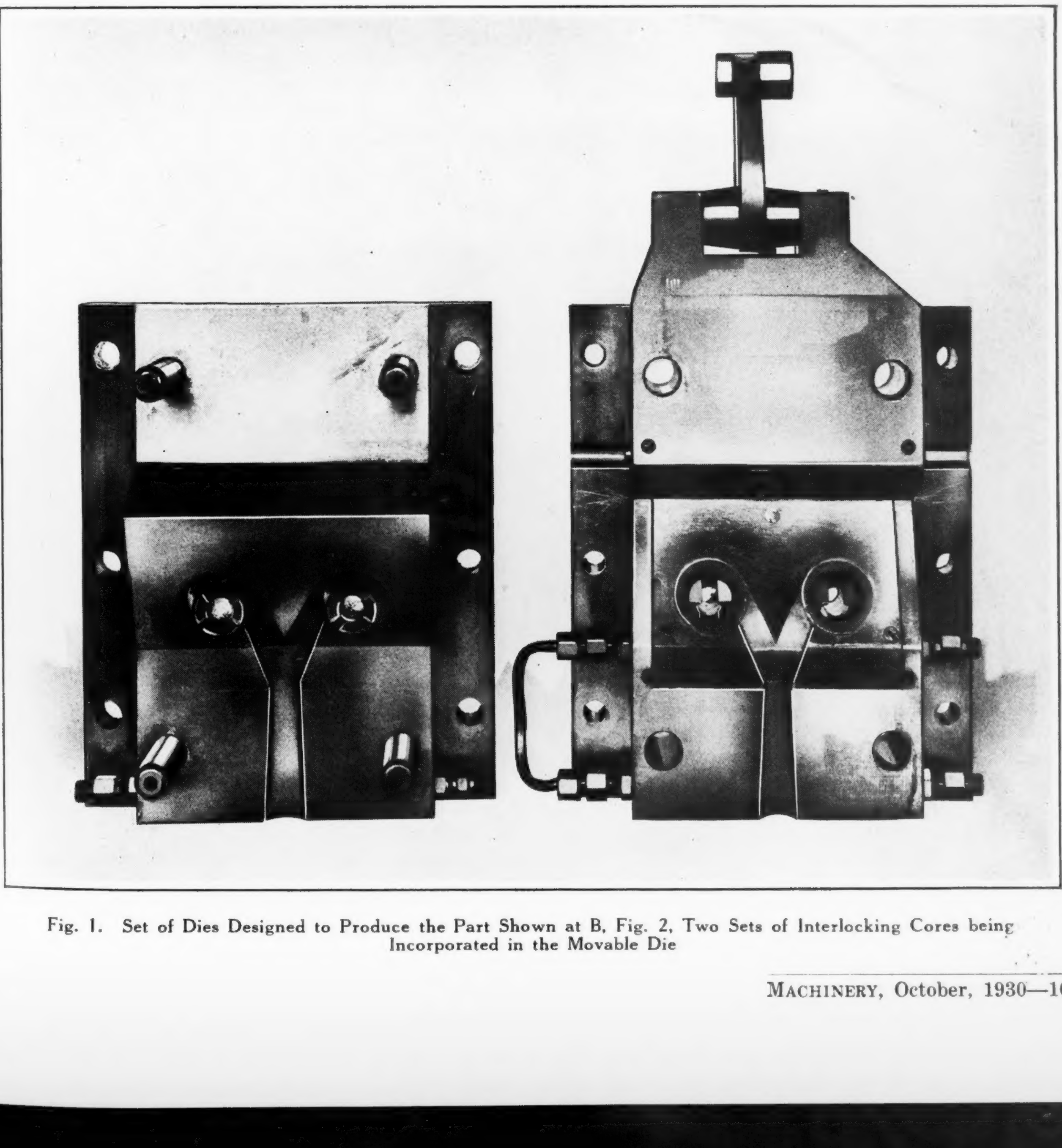


Fig. 1. Set of Dies Designed to Produce the Part Shown at B, Fig. 2, Two Sets of Interlocking Cores being Incorporated in the Movable Die

hole in the casting. Since there are two identical cavities in the dies, as seen in Fig. 1, there are, of course, two cores *G* and two cores *H*.

When the movable die recedes from the stationary die at the end of an operation, lever *J* is swung on its pivot as a roller at the upper end is carried along the path formed by cam-blocks on the combination bar *K* at the top of the machine. Lever *J* is connected through a rod to the outer ends of the two holders to which cores *H* are attached, and hence this movement of lever *J* causes the cores to be withdrawn horizontally. Directly afterward, bell-crank lever *L* is swiveled on its pivot as the roller attached to the upper end of the lever passes along a second path of the cam-blocks on bar *K*. The swiveling of lever *L* causes rod *M* to be lifted, which, through links *N* and *O*, pulls cores *G* upward as required.

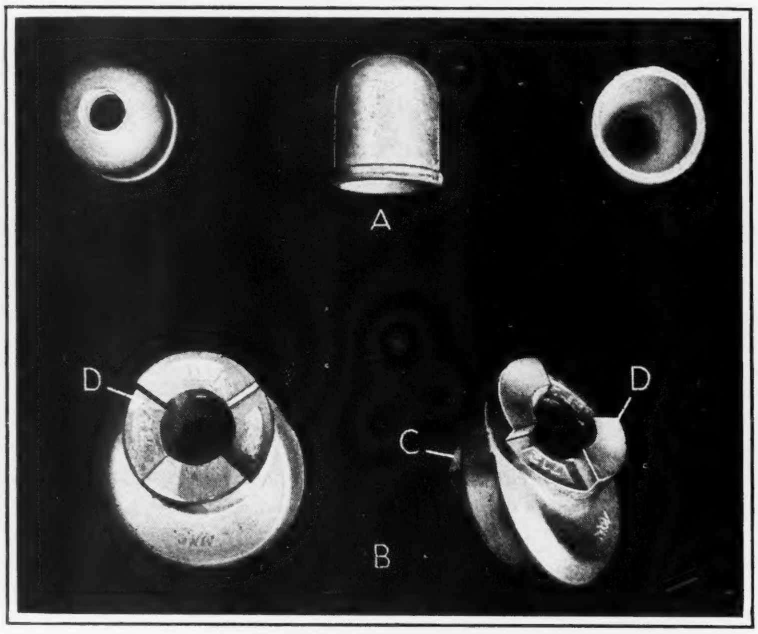


Fig. 2. Small Zinc Castings Produced at High Rates of Production by Means of the Dies Illustrated in This Article

When the movable die advances to the stationary die preceding an operation, all these parts are operated in the reverse direction to bring cores *G* and *H* to the position illustrated. Two cores *P*, which form face *D*, Fig. 2, of the casting, are immovably fixed in the stationary die.

Arrangement of the Ejector Mechanism

As the movable die carriage nears the end of its return movement from the stationary die, a roller fastened to the right-hand end of link *Q*, as shown in Fig. 3, strikes a stop on one of the guide bars of

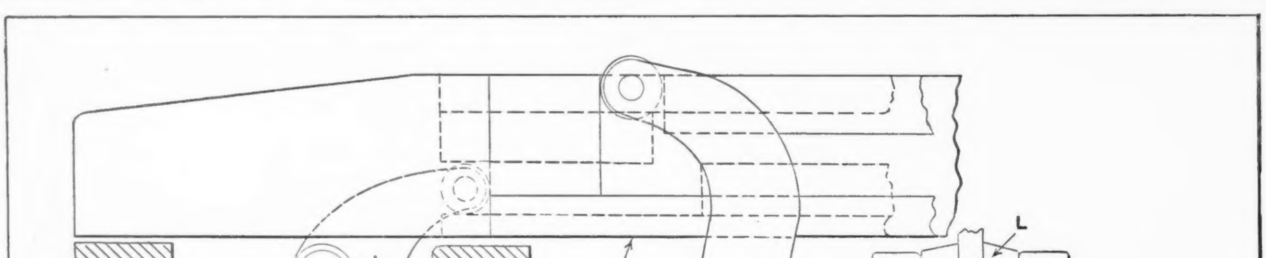


Fig. 3. Mechanism Employed for Moving the Four Interlocking Cores and the Two Ejector-pins of the Movable Die Shown at the Right in Fig. 1

the die-casting machine. Thus, as the carriage continues to withdraw, link Q is swiveled upward on its axis and holds an ejector-pin R stationary in each cavity, so that the die proper can slide back along pins R. As the castings reach the two ejector-pins, they are forced out of the die cavities. Rod T connects the two ejector-pin holders S so that both are actuated by link Q. This mechanism operates in the reverse manner to remove the ejector-pins from the die cavities when the dies are being closed.

plate F which is moved horizontally a distance of about 1 1/4 inches when the movable die is fed to the stationary die. This movement of the cores is produced by a roller attached to bellcrank lever G, which rides along a cam path formed by blocks on a combination bar fastened to the top of the die-casting machine, the arrangement being the same as in the preceding example.

When the movable die is withdrawn, this roller rides up the cam path, causing the bellcrank lever

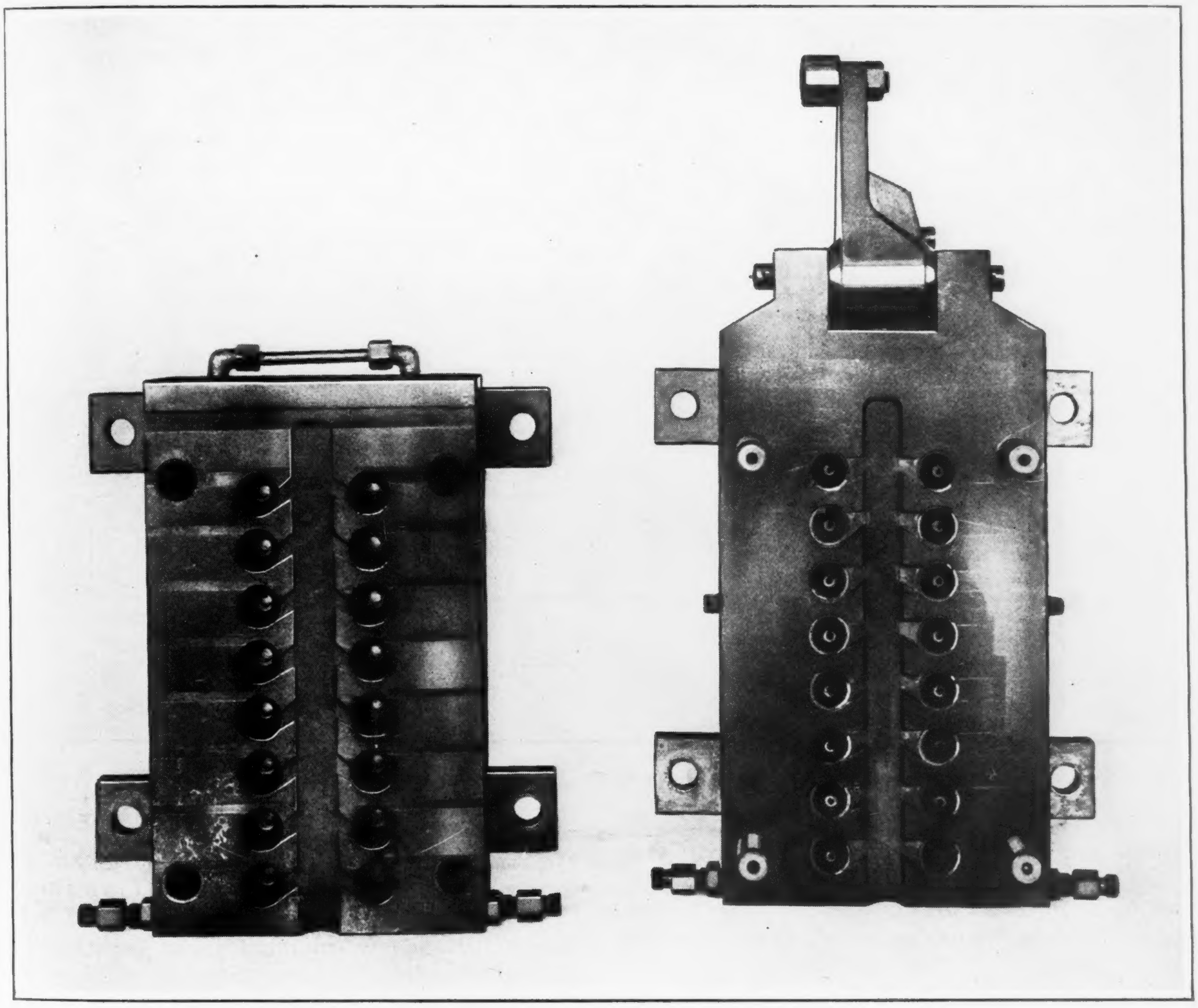


Fig. 4. Set of Dies Used for Casting Small Cups A, Fig. 2, at the Rate of 128 per Minute

to swivel, and this motion, through link H, pulls the two slides J upward. Each of these slides contains two cam grooves a in which rollers on the sides of plate F travel. Consequently, as slides J are raised, plate F is pulled back horizontally an amount equal to the throw of the cam grooves.

Obviously, when the movable die advances toward the stationary die, the reverse action occurs and the cores are moved forward into the cavities of the stationary die. Both dies are water-cooled when in use.

Pipe connections are provided on both dies to provide for the circulation of water for cooling purposes.

Dies for Casting 128 Cups a Minute

Small zinc cups of the type shown at A, Fig. 2, are cast at the rate of 128 per minute in the dies illustrated in Fig. 4. These cups are approximately 7/8 inch long by 3/4 inch in diameter and have a hole that tapers down from 5/8 inch in diameter at one end to 1/4 inch in diameter at the opposite end. Sixteen cups are produced with each "shot" of molten metal into the dies.

Sliding cores E, Fig. 5, are used to form the inside of the cups. These cores are arranged on a

This series of five articles now concluded has pointed out various advantages obtained through the use of die-casting dies that are fully automatic. Some of the advantages are high production, low

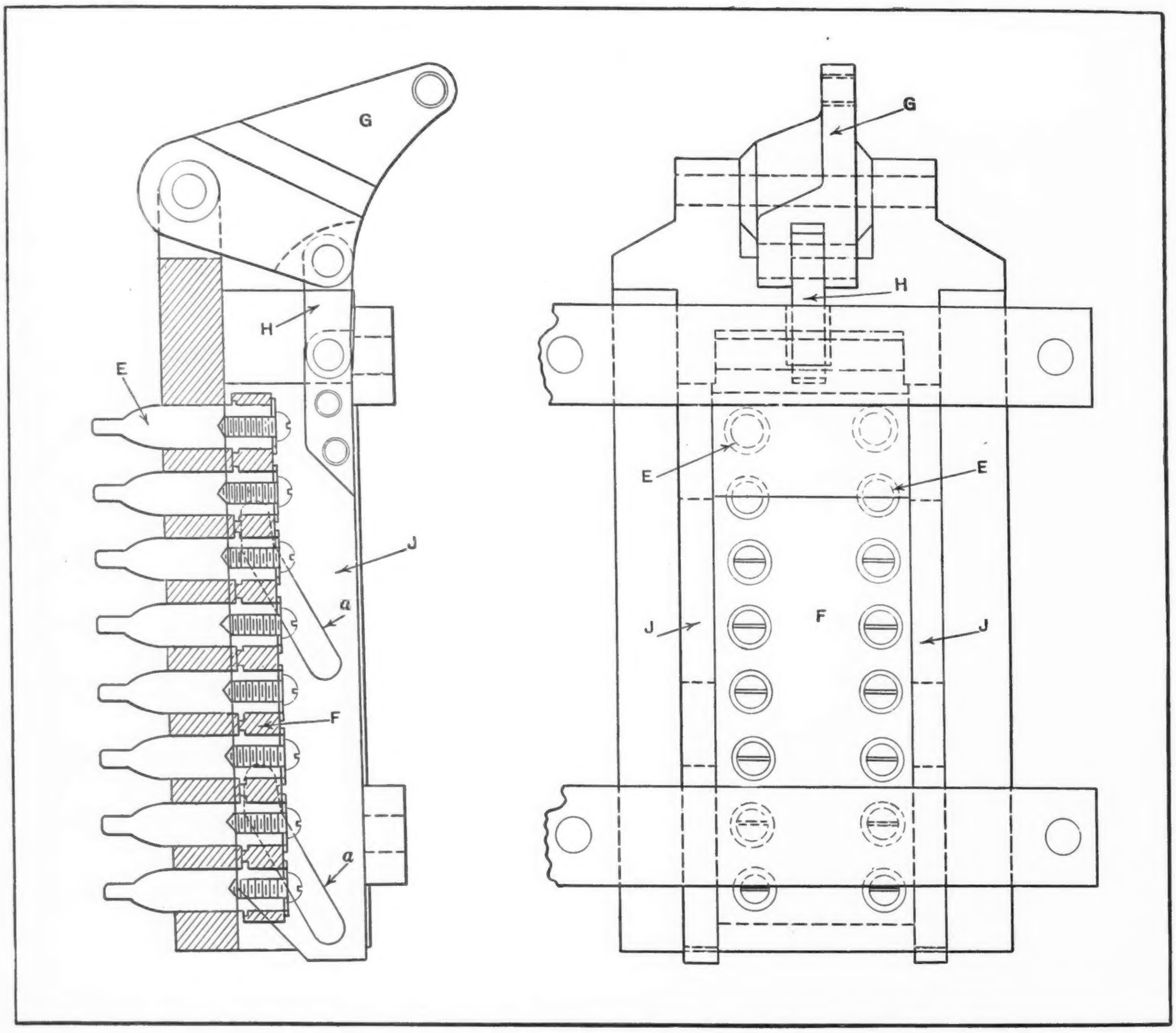


Fig. 5. Mechanism Provided in the Movable Die Shown at the Right in Fig. 4, for Moving Sixteen Cores Horizontally

costs, accurate castings, and safe operation. Another feature of major importance is the elimination of the strenuous efforts sometimes required by an operator and two or three helpers to open the dies when a number of cores must be withdrawn manually from the casting.

In the dies described in these articles, simplicity of construction has been achieved by incorporating the core mechanisms in the die units themselves. The cores of the movable die members are operated automatically by cam bars as the die halves are opened and closed. Simple means are also employed for "pulling" the cores of the stationary die members.

Patents have been applied for to cover the various mechanisms described in this series of articles.

* * *

During the first six months of this year, the General Electric Co., Schenectady, N. Y., paid $56,974 to employes for suggestions pertaining to improvements in the company's products or methods. A total of 17,474 suggestions were made, of which 5616 were adopted.

NOVEL USE OF HOLLOW COLUMNS

In the construction of the new research and engineering building of the A. O. Smith Corporation, Milwaukee, Wis., a unique application has been made of the hollow column type of construction. The hollow columns are employed as passageways to carry steam pipes, electric light wires, water pipes, telephone wiring, and other conduits required in the regular operation of the building. They also carry such pipe lines as high-tension lines for electric welding, compressed air lines, fuel oil lines, and oxygen supply lines, for use by the research engineers in their work in different parts of the building.

The girders, as well as the columns, are of hollow construction and carry pipe and wiring concealed in the same manner. In this way, various kinds of energy are available within 10 feet of any point in the entire building; and, yet, throughout the building, there are no unsightly pipe lines or conduits visible. The columns and girders are also used as ducts for a complete ventilating and air-conditioning system, thus making use of these columns to the fullest extent.

Maintaining Efficiency of Journal Bearings

Determining Operating Condition of Journal Bearings by Temperature Tests, and Methods of Preventing and Eliminating Overheating

By J. D. LLOYD, Lubrication Engineer, U. S. Fuel & Metals Corporation

IN order to keep a machine or unit operating at its maximum efficiency, the person in charge must be familiar with the various normal running temperatures of the bearings. In a normal bearing, the temperature will rise to a point where the amount of heat produced in the bearing is just balanced by the amount of heat radiated by metallic parts to the surrounding air, plus the heat that will be carried away by the oil and the frame of the machine under normal conditions.

There are a few simple rules to be observed in the care of journal bearings. Too frequently these rules are disregarded, with the result that machines have to be shut down, production is interrupted, and needless expense incurred. The author of this article outlines the causes of overheated bearings, indicates the temperatures that should not be exceeded, gives instructions as to what to do when there is a "hot box," and gives advice as to precautions to be taken in cooling overheated bearings. He also points out the effect of weather conditions on bearings, recommending the type of oil to be used in cold and in hot weather. Generally speaking, greater precautions must be taken to prevent bearing troubles in the summer than in the winter. Frequently, bearing troubles in the summer are due to the greater amount of dust in the air at that time of the year rather than to the increase in temperature, although the troubles met with may be due to either cause.

Keeping a Check on the Bearing Temperature

When possible, the thermometer that indicates the temperature of a bearing should be placed in the lubricating oil. However, the temperature can also be obtained by placing the thermometer on top of the bearing where it will be safe and where the bulb will be close to the greatest amount of bearing metal.

The thermometer should be tied in place as a precaution against breakage. It is also advisable, and in fact necessary for accurate results, to protect the thermometer bulb by asbestos in order to prevent the air from influencing the reading. The asbestos can be so formed that it will fit about the bulb without touching it and can be held in place by a string.

When the temperature of a bearing is to be obtained at frequent intervals over an extended period of time, and when the thermometer must be removed and replaced, it is well either to label the thermometer or to make a record of its number and the exact place where it is to be used. By following this practice, the temperature of each bearing will always be obtained with the same instrument, and, consequently, it is of less importance that the thermometer gives absolutely standard readings.

Operating Temperatures of Bearings

Although most bearings operate at temperatures ranging from 90 to 120 degrees F., the temperatures may often be as low as from 70 to 90 degrees F., if the machine is operated at a slow speed or the temperature of the surrounding air is quite low. It might be mentioned here that when bearings operate in a cold atmosphere, oils of relatively low viscosity and low "cold test" should be employed. If a "low cold" test oil is not employed under such conditions, there is danger that the oil will congeal and an adequate supply will not reach the bearing.

Frequently, the temperature of high-speed bearings rises above 120 degrees F. Ordinarily, the temperature of such bearings will not go above 160 degrees F. Bearings should never be allowed to run at a temperature higher than that which can be borne by the hand, or about 140 degrees F.

When the temperature exceeds 160 degrees F., a careful study should be made of the mechanical and lubricating conditions of the bearing. Temperatures above 120 degrees F. may well be termed "high," but temperatures above 160 degrees F. may actually prevent the machine from functioning or even cause considerable damage.

What Causes Overheated Bearings?

Overheated bearings are likely to be due to one or more of the following causes: (1) An unsuitable lubricant may be used, that is, one that is either too viscous or too fluid to suit the operating conditions; (2) the bearing may not be receiving a sufficient amount of oil; (3) the journal shaft may be out of line; (4) ineffective functioning of parts of the machine other than the bearing may cause the bearing to become overheated. For example, the overheating of the main bearings of engines may be caused by too little compression in the steam cylinder. This compression should act as a cushion for the inertia of the reciprocating parts at the end of the stroke. Consequently, when the compression is too low, the oil film is subjected alternately to high and low compression, a condition that tends to impair its uniformity.

Excessive bearing temperatures due to either faulty mechanical or lubricating conditions should be corrected as promptly as possible in order to reduce power losses and maintenance costs. This need be emphasized, because so often overlooked.

Effect of Hot Weather and Other Conditions on Bearing Maintenance

It is common knowledge among maintenance and operating men that trouble with bearings is encountered more frequently in summer than in winter—assuming the number of hours of operation and the loads to be the same in both seasons. Usually such troubles are due to the greater amount of dust in the air in summer. The dust finds its way into the bearings, resulting in a greater amount of friction and higher bearing temperatures. Cooling is also more difficult, owing to the higher temperature of the surrounding air. Therefore, overheating and even "freezing" of the bearings is more likely to occur in summer than in winter.

When machinery is operated in a heavily dust-laden atmosphere, the open ends of the bearings should be provided with felt washers. These washers should be placed around the shaft and held in place by metal collars. Dust-excluding devices having split collars, which enables them to be applied without difficulty, may be obtained.

In order to keep bearing troubles at a minimum during hot weather or when the bearings are subjected to excessively warm operating conditions, the following precautions should be taken:

1. Use a sufficient amount of good quality oil of the proper grade for each bearing.
2. Inspect the oil-grooves of the bearing more frequently than in winter, and make sure that they are not obstructed.
3. Use a bearing metal of a grade best suited to the particular conditions under which the bearings operate.
4. Observe every possible precaution in making the bearing liners.

Sometimes bearings become too hot not through any fault of the bearing, but because of the proximity of steam or some other source of heat. Effective lubrication of bearings so located depends primarily on the use of a lubricating oil of sufficiently heavy body. When bearing temperatures are normally in excess of 180 degrees F., special consideration must be given to the characteristics of the lubricant in order to avoid vaporization and carbonization of the oil. In other words, the oil must provide a lubricating film having sufficient strength to meet the running conditions. When both the temperature and bearing pressure are high and the speed is low, it is often preferable to use a grease instead of an oil. The grease should, of course, be adapted to the specific bearing.

What to Do when a "Hot Box" is Observed

When bearing temperatures are excessive, it is difficult to maintain the lubricating film, because the tendency is for the bearing surface to become dry. It is probable that the strength or surface tension of the lubricating film is reduced by the heat, causing the oil to be drawn toward the cooler parts of the bearing where the surface tension of the liquid is greater.

When a "hot box" is observed, first loosen up the bearing all around. Then apply a generous quantity of oil through the oil-hole, or if this does not reduce the temperature, feed to the bearing a mixture of one part of graphite to ten parts of heavy engine oil. Even heavy steam cylinder oil may possibly be used for this purpose. Instead of this treatment, a cooling compound may be used which is made up as follows: To any desired quantity of white lead, add double the quantity of tallow and a very little graphite, after which thin the mixture with enough cylinder oil to enable it to be fed freely to the hot bearing. This compound can be prepared easily and quickly, and usually proves very effective.

Precautions in Cooling Overheated Bearings

A stream of water should never be directed on an overheated bearing or crankpin to cool it, except as a last resort, and only then, in cases where the machine must be kept running at any cost until such time as it may be shut down for repairs. The use of water for cooling the bearing is likely to cause serious distortion.

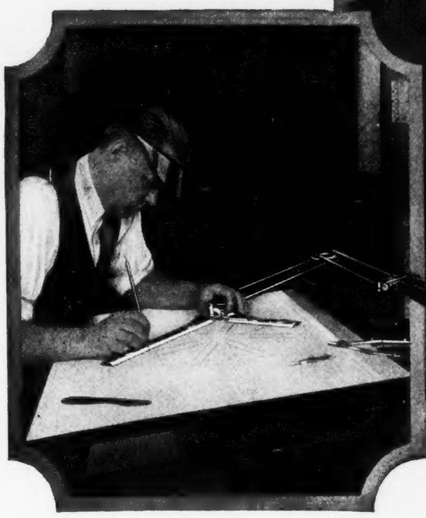
If a babbitt bearing becomes overheated, it should be opened and any spots that appear darker than the rest of the surface should be scraped. The darker spots are the high points on the bearing surface. Always make sure that the oil-grooves or feeds are clear. If these are clogged or obstructed by metal, they must be cleared.

If a brass or bronze bearing becomes overheated, distortion resulting from the heat may require the bearing to be refitted. To do this, first coat the journal surface with red lead, apply the "brasses," and then slide them around the journal. The high spots on the brasses will be indicated by red lead streaks. These streaks or spots should be scraped down and the process repeated until the whole contact surface is covered with red lead when the brasses are slid around the journal.

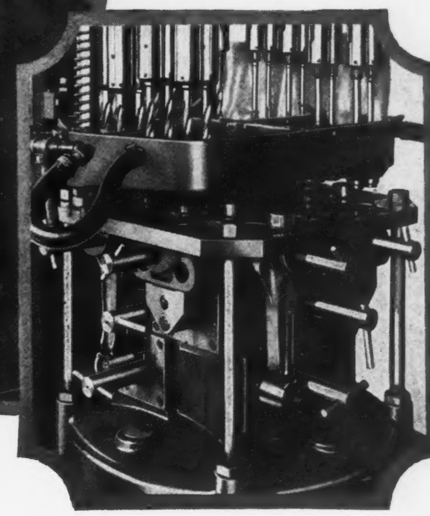
* * *

SAFETY CONGRESS IN PITTSBURGH

As MACHINERY goes to press, the Nineteenth Annual Safety Congress and Exposition assembles in Pittsburgh, Pa., beginning September 29 and continuing until October 3. A very complete program has been prepared for the Congress, covering almost every industry. In the fields covered by MACHINERY, special sessions will be devoted to safety problems in the automotive, metals, power press, and railroad branches of industry. In the power press section, the program includes papers on: "Safety in Power Press Clutch Design" by W. E. Widell, chief machine designer, American Can Co., Cincinnati, Ohio; "The Opportunity of the Die-setter" by George Miller, supervisor of tools, Metal Stamping Department, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.; and "Production with Safety in a Small Power Press Plant" by H. C. Howsam, superintendent, Hubbard Spool Co., Chicago, Ill.



Design of Tools and Fixtures



FORMING AND BLANKING DIE FOR RADIATOR FINS

By P. H. WHITE, St. Louis, Mo.

A large number of fins, such as shown at *F*, are assembled on steam-radiator tubes in order to increase the heat-radiating capacity. These fins are blanked and formed in the die shown in the accompanying illustration.

The fins are stamped from sheet brass of a light gage, the lay-out of the different stations being shown in the upper view. At the first station, the small cross shown at *A* is pierced and also the half circle *B* which serves to locate the strip during the subsequent operations.

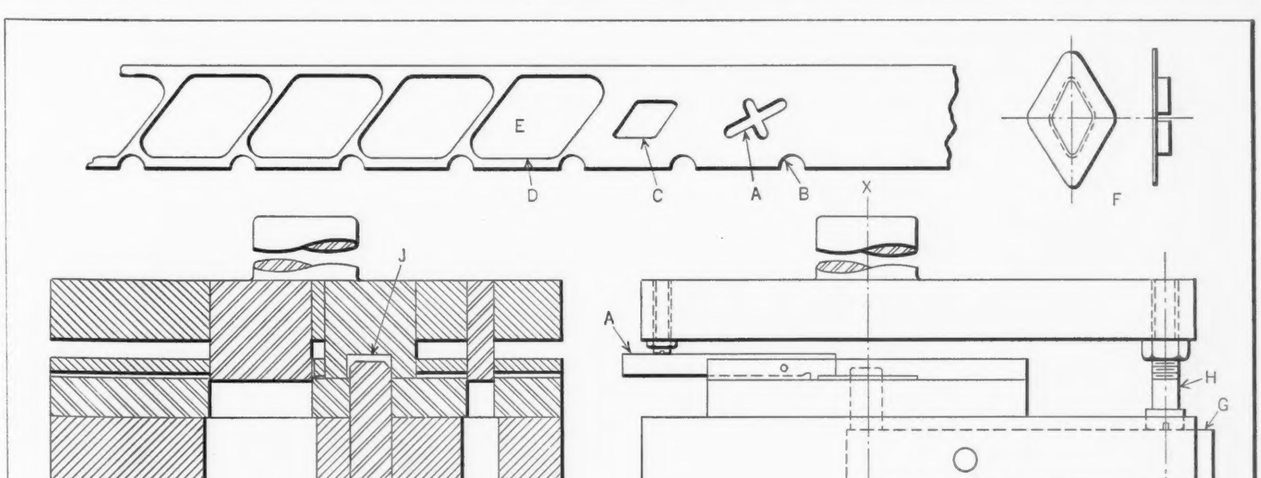
At the next station, the four inner portions of the cross are forced upward, leaving the diamond-shaped hole *C* in the strip. This is done by means of the lever *G*, which is forced down at its outer end by the adjustable screw *H*, fastened in the punch-block. The section shows the inner end of this lever in its raised position.

The punch-block carries a hollow die *J* which engages the ascending punch on lever *G* and forms the fin. At the next station *D*, the fin is blanked out, leaving the hole *E* in the strip. Thus, in starting a strip into the die, three strokes are required to make the first fin, after which one fin falls from the die after each stroke. Lever *A* (lower view) serves as a stop for the strip.

THE USE OF A TAPER ATTACHMENT FOR SPHERICAL TURNING

By RUDOLF SPACEK, Cleveland, Ohio

The spherical surface *B* of the ball-shaped part shown in Fig. 1 and the spherical cavity *A* of its housing are required to be machined to the tolerances indicated. After attempting to handle this work on several different machines without satis-



Combination Piercing, Forming, and Blanking Die for Fin shown at F

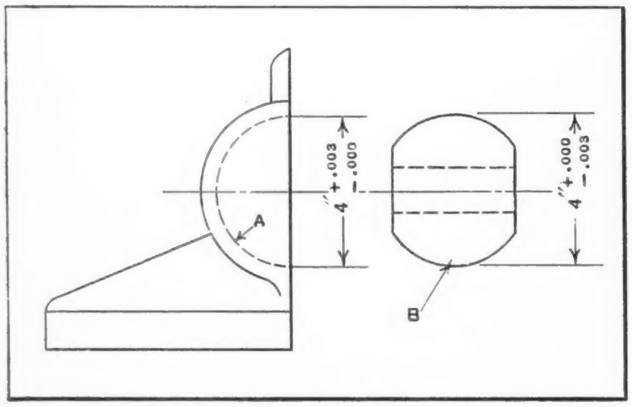


Fig. 1. Parts Requiring Spherical Turning Operations

factory results, the writer discovered that a lathe equipped with a taper turning attachment, such as shown in Fig. 2, could be readily adapted for the job. Incidentally, this particular attachment is shown and described in MACHINERY'S ENCYCLOPEDIA, Volume VI, page 184.

The first step in equipping the attachment for spherical turning was to remove the slide *S*, Fig. 2, also block *F* and the bar *E*. The slide *S* was then replaced by a disk *K*, Fig. 3; the hole in the center of the disk is bored and reamed to a close fit on the pivot pin *I* of the slide. Two holes were also made in the disk to fit the pin *J* which connects the disk with bar *G*.

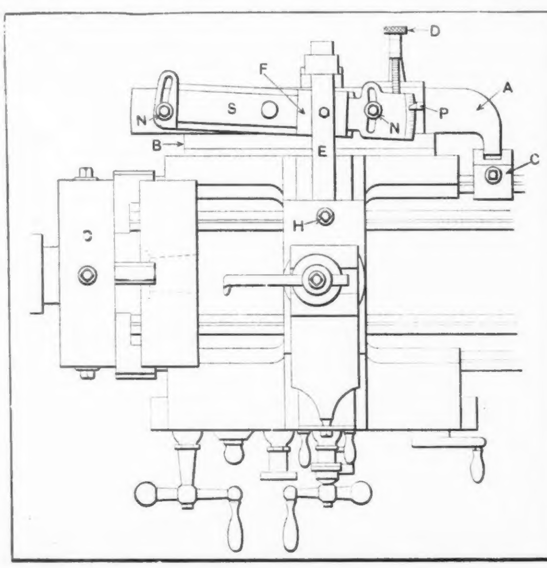


Fig. 2. Taper-turning Attachment which was Adapted for Spherical Turning

One of the holes in the disk was located 2 1/16 inches from the center, this dimension being equivalent to the radius of the spherical surface of the ball to be turned, plus 1/16 inch, the radius to which the end of the turning tool is ground. The other hole in the disk, which is used in turning the spherical cavity in the cast-iron housing, is located at a distance of 1 15/16 inches from the center. This distance is equal to the radius of the cavity minus the radius to which the cutting end of the tool is ground. The holes in the disk were made a very close turning fit for the stud *J*. Although not shown in the illustration, the spherical cavity *A*, Fig. 1, has a cored hole at the center which makes the turning operation slightly less difficult.

Besides removing the bar *E*, Fig. 2, the cross-slide feed-nut was removed from the carriage feed-screw. The bar *G*, Fig. 3, was then secured to the cross-slide. The other end of this bar is a close sliding fit in the bearing *L*, which is secured to member *B*. Member *B*, in turn, is attached to the carriage. The block *C* is clamped to the lathe bed and holds member *A* stationary.

It is obvious that feeding the carriage to the right or left will cause the disk *K* to revolve about the fixed pin *I*. This action, in turn, will cause the bar *G* to slide in bearing *L* and move the cross-slide inward from the position shown, forcing the tool point to follow an arc having a radius equal to the distance from pin *I* to pin *J*.

Thus the work *W* is turned to the desired radius, the depth of the cut being controlled by the handle *N* secured to the feed-screw of the compound tool-slide. For turning the cavity or spherical surface *A*, Fig. 1, the pin *J* is placed in the other hole in the disk and the work held on a faceplate.

CHUCK WITH RUBBER EQUALIZING PAD

By WALTER H. FRIEDRICH, Philadelphia, Pa.

The cast-iron part shown in Fig. 1 is required to have the end at *A* turned to a radius of 3 1/2 inches. For this operation, twenty-four pieces are mounted radially on the face of a special lathe chuck. Individual clamps were used at first to hold the pieces in place, as irregularity in the thickness, due to the unfinished side *B*, made it impossible to hold the pieces with a solid clamping ring or disk.

As the clamping of each individual piece consumed considerable time, the chuck shown in Figs. 2 and 3 was devised. This chuck enables the twenty-four pieces to be clamped securely in place by simply tightening the nut *J*, Fig. 2, on spindle *I*. The rubber clamping pad *C*, Fig. 3, compensates for the variations in the thickness of the pieces.

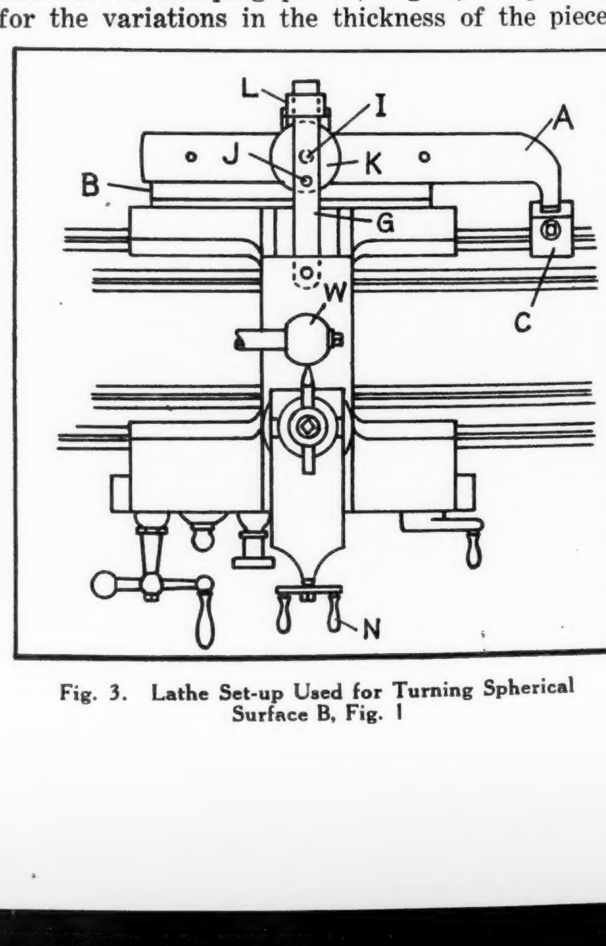


Fig. 3. Lathe Set-up Used for Turning Spherical Surface B, Fig. 1

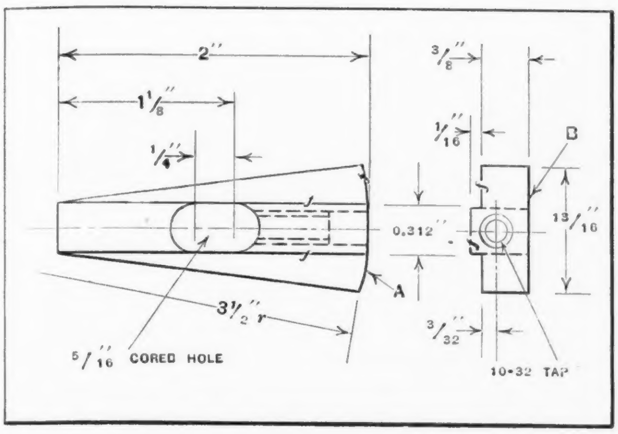


Fig. 1. Cast-iron Part with the Surface A Turned to the Required Radius

With this new fixture, the cost for turning the curved surfaces on 100 parts was reduced from \$1.07 to 32 cents. The clamping pad *C* is about 1 inch thick, and was turned from a solid rubber slab of the kind used for pressure pads of forming dies. Five thousand parts have been turned with this chuck so far without causing any appreciable wear on the rubber pad.

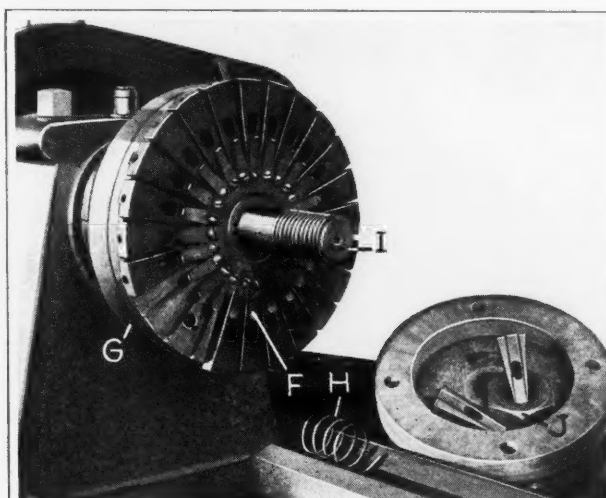


Fig. 2. View of Partly Assembled Chuck Shown in Fig. 3

In loading the chuck, the ring *E*, Fig. 3, is released by loosening the clamping nut slightly and then inserting the parts in the radial keyways or grooves in plate *G*. The parts are pushed against a stop and held from falling out by spring clips like the one shown at *F*, Fig. 2.

In assembling the parts of the chuck shown in Fig. 2, the spring *H* is placed on the spindle *I*, after which the pad *C*, Fig. 3, and the clamping ring are put in position. The parts of the assembled chuck are then secured in place by screwing the nut *J* on spindle *I*. The spring *H* serves to force the clamping pad out of contact with the parts when the nut *J* is loosened to permit the work to be removed.

DIE ADJUSTABLE FOR FORTY-TWO DIFFERENT PARTS

By E. F. EBERHARD, Bridgeport, Conn.

The accompanying illustration shows an interesting die of the combination type used for piercing the fulcrum holes in key levers, stamping the part number, countersinking the pierced hole, assembling a stud into this hole, and staking the stud. These levers are part of a calculating machine and are of forty-two different lengths. A few of them are indicated in heavy dot-and-dash lines. The location of the pierced hole is different in each lever, varying along the distance *X*. Formerly forty-two separate piercing dies were used to cover the entire range of levers, while the remaining operations were performed in single dies.

The die-shoe and punch-holder to be described are of the liner-pin type. On the shoe is located a hardened tool-steel slide *A* which supports a stamp-holder *B*. On the slide are also located pins *U*, *D*, and pad *R* for locating the key lever when piercing the hole and stamping the part number. There is a key *C* on the under side of slide *A* which engages a slot in the die-shoe, and two elongated slots in the slide for locking bolts *E* permit adjustment for the different levers.

Die-block *F* is fastened to the die-shoe by screws and projects up through the slide *A*. Movement of the slide is effected by means of the screw *H* which fits in a tapped hole in the slide and bears against one end of the stationary block *F*, maintaining a pressure on the locating block *G* until locking bolts *E* are tightened. There are forty-two stamps *J* and forty-two locating blocks *G* required, one for each lever. Both stamps and blocks are numbered to correspond with the lever to be pierced. As these stamps are all the same length, they govern the shut height of the die. The other die parts are adjusted accordingly.

Adjustment is also provided to compensate for the metal removed from the punch and die parts in the sharpening process, by means of screws *O* and *T*. Punch *K* is held in the holder *L* by the

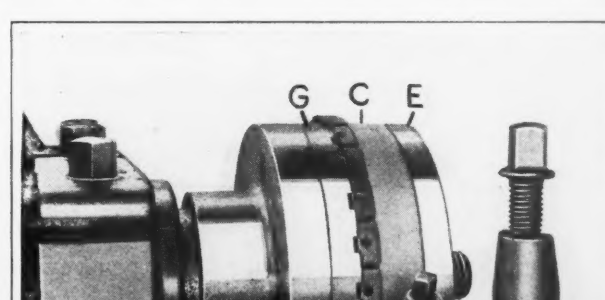
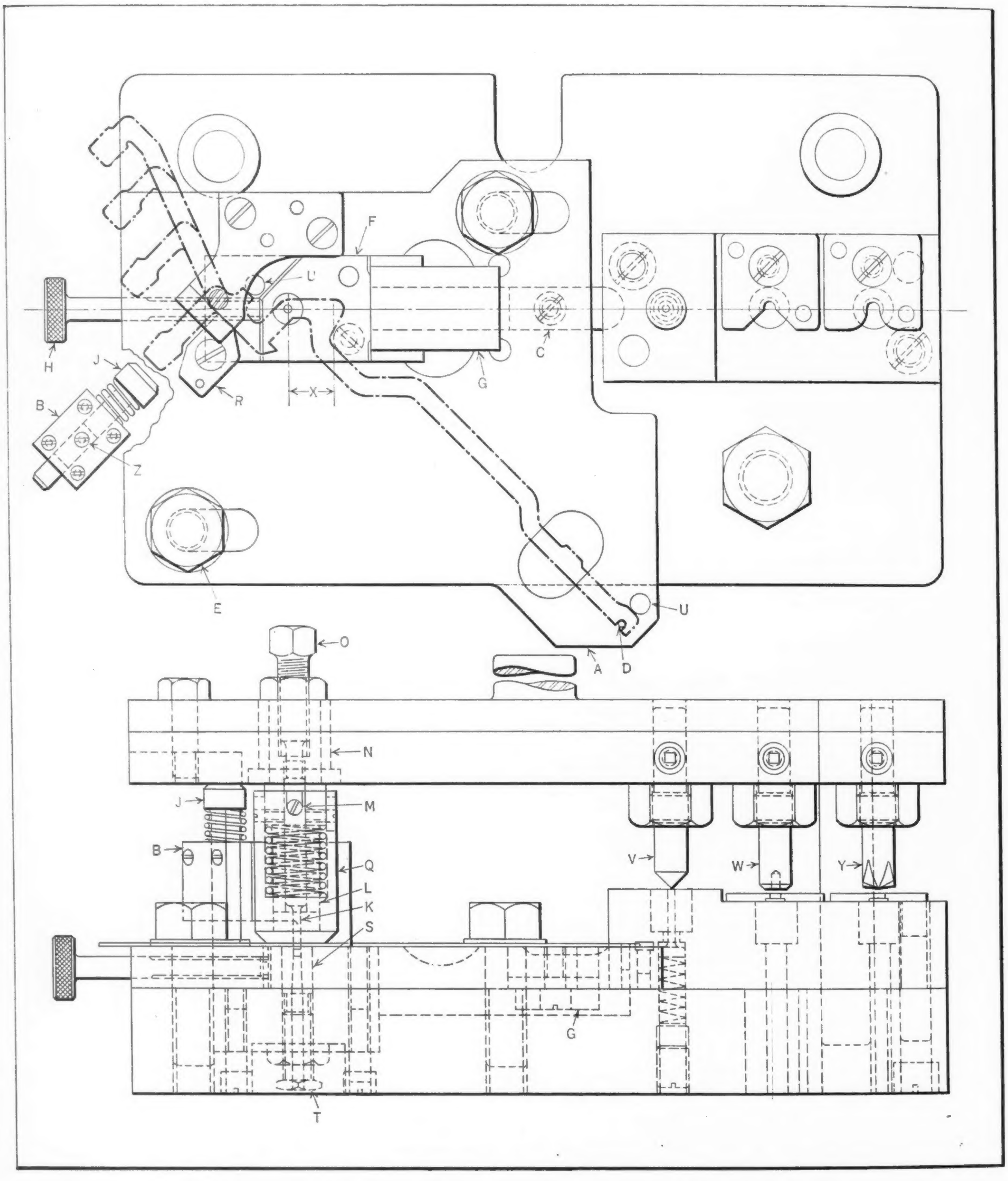


Fig. 3. Chuck Used in Turning Curved Surface on Twenty-four Parts Simultaneously



Combination Die in which Location of Hole is Controlled by Size Blocks

screw M, and holder L is a force fit in the sleeve N. Adjusting screw O is always in contact with the punch K, and when the punch is set at the required height, the screw is secured by a lock-nut.

The punch and holder are enclosed by a circular spring stripper Q, the travel of which is limited by screws that are fastened in the holder L and engage elongated slots in the stripper. Die S is a circular insert forced into block F, and is supported at its lower end by the adjusting screw T, which holds it flush with the top face of block F. Screw T is held in place by a lock-nut, and has a hole drilled through the center to allow the slugs from the pierced holes to drop through. Member V is a countersinking punch; W is a punch for forcing the stud into the key lever; and Y is a staking punch to stake the stud to the lever. These three punches are also adjustable for height.

In operation, the proper stamp J and corresponding locating block G are selected, the block being located in the slide as shown and tightened in place by the screw H. The screws E are then tightened, and the stamp J is mounted in the block B and held in place by means of the set-screw Z. The work

is next placed on slide *A*, and located by pins *U*, *D*, and pad *R* in the position shown. As the ram descends, the lever is pierced and the part number stamped.

The lever is then removed from the left-hand end of the die and countersunk by the punch *V*. Next, a key lever stud is inserted in the die under the punch *W* and the lever is placed above it. As the ram again descends, the punch forces the lever over the stud. The next operation is to stake the stud to the lever, which is done by punch *Y*.

The cost of the single piercing die formerly used for this work was $150, and as there were forty-two dies, the total cost was $6300. Added to this was the cost of the assembling, countersinking, and staking dies, which was $150. The die here described for piercing, stamping, countersinking, assembling, and staking the forty-two key levers cost $450, thus effecting a saving of $6000 in tool costs.

WELDING FIXTURE FOR ROLLER BEARING RETAINER

By B. J. STERN, New York City

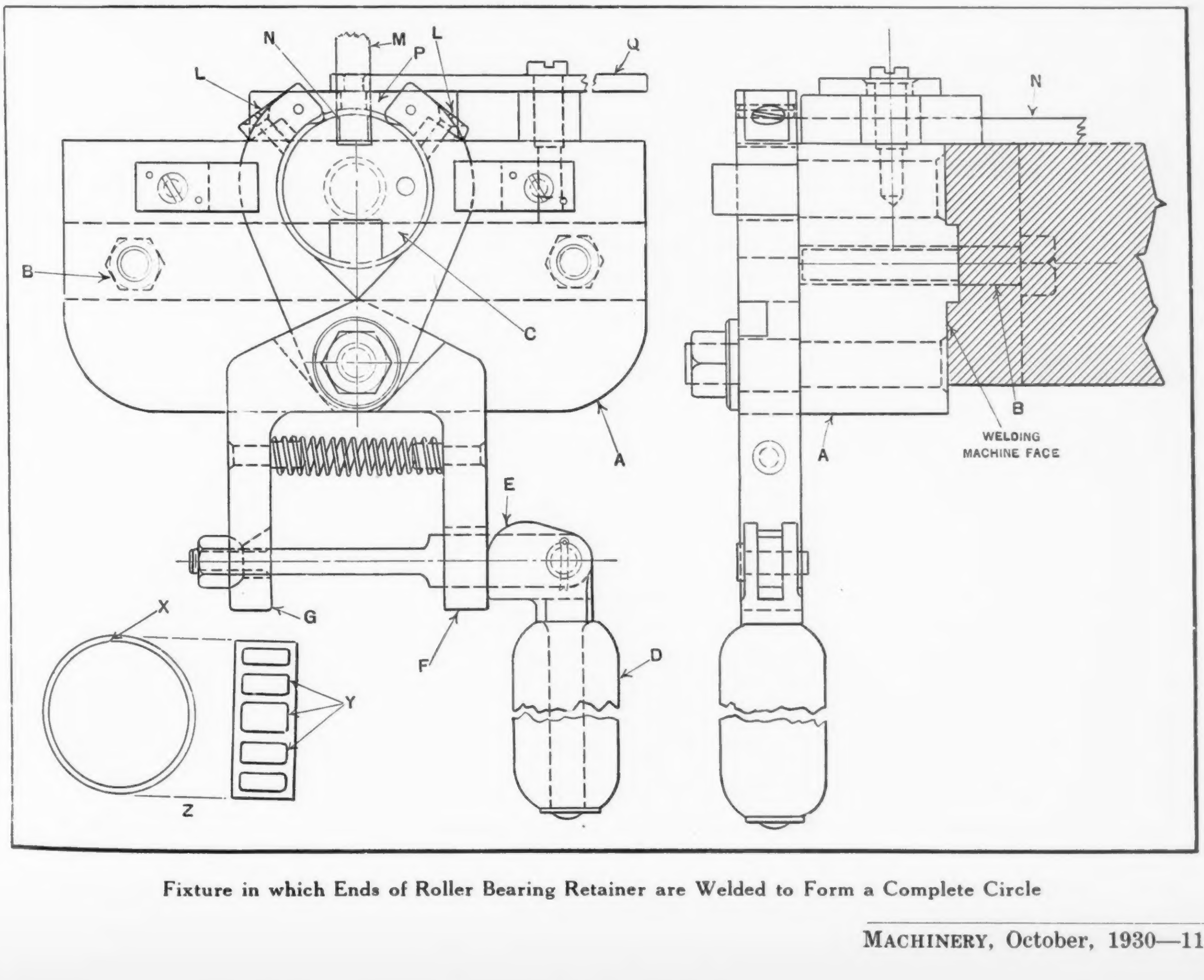
The spot-welding fixture shown in the illustration is used for welding together the ends of roller bearing retainers. The retainer, after passing through a series of operations, is rolled into the circular shape shown at *Z*, and finally welded at *X*.

The fixture is fastened to the face of the machine by means of the bolts *B*. The piece to be welded is slipped over the plug *C*, which is a drive fit in base *A*. Plug *C* is made of hard rubber, and acts as an insulator. The handle *D* is then pushed downward, so that the cam face *E* forces the lower ends of the clamps *F* and *G* toward each other, while the upper ends clamp the retainer securely to the plug. Two hardened points *L* on these clamps, besides serving to draw the ends of the retainer together, act as locators, entering the equally spaced openings *Y*.

The terminal *M* is now brought down by means of a foot-treadle against the ends of the retainer, which rest on the terminal *N*. The current is then switched on and the ends are welded together. As soon as the weld is completed, the terminal *M* is raised and the handle *D* pulled up, thus opening the clamps and freeing the work. The work is forced off the plug by the ejector *P*, operated by the handle *Q*.

* * *

In the census of manufactures, covering production in 1929, the extent to which manufacturers engage in wholesale and retail selling of their goods will be shown for the first time. Six types of channels through which products may be sold are specified, and the census, when completed, will show the manner in which different products are disposed of to the trade.



Fixture in which Ends of Roller Bearing Retainer are Welded to Form a Complete Circle

Efficient Grinding Wheel Supervision Pays

Suggestions that will Aid in Obtaining Maximum Economies in the Use of Grinding Wheels—A Bonus Plan for Grinding Machine Operators

By JOHN ALEXANDER

FEW mechanics realize the economies that can be effected through the proper supervision of grinding wheels. Even when grinding is the only or chief operation performed in a department, the foreman is often so occupied with other matters that thousands of dollars may go to waste because of the use of wrong kinds of wheels, and because careless and wasteful operators are not properly supervised, but left to devise their own methods.

While much good advice is given to grinding wheel users by the representatives of wheel manufacturers, the close attention necessary for obtaining efficiency and economy is impossible without the constant supervision of a qualified man. Several large plants recognize this fact and employ full-time "abrasive engineers."

The amount of attention which should be devoted to this problem can be determined only by the individual plant and should be based on the amount of money expended for wheels and the quantity of grinding done. Two or more small plants, each of which do not have a large enough volume of grinding to justify the employment of a man full time for this work, could use him jointly with considerable profit. The following suggestions, if followed, will result in worth-while savings.

Few men engaged in machine shop work realize how great are the economies that can be effected through the proper supervision of the use of grinding wheels. Even when grinding is the only or the chief operation performed in a department, the foreman is often so occupied with other duties that thousands of dollars may go to waste because of the use of the wrong kinds of wheels, the ineffective use of proper wheels, and careless and wasteful operators who are not properly supervised. Any shop that uses grinding wheels to a considerable extent will find Mr. Alexander's suggestions of considerable value. So much attention is paid to the reduction of labor costs that possible reductions in the cost of accessories used in manufacturing are often overlooked by the men in charge.

Investigate the Results Obtained from All Wheels

The life of all grinding wheels should be checked up to determine which wheels are giving the best service; what the wheel requirements are for any given period or for any given quantity of parts to be ground; the number of wheels that should be kept in stock; and the characteristics of the grinding wheel operators. The nature of the work done by all wheels should also be investigated to see if the size, grit, and grade of the wheels used are the best suited for the operations and if the machines on which they are employed are the most desirable.

Experiments should be conducted with wheels of different grits and grades in order to determine the best possible wheel for the various jobs. Rubber- or Bakelite-bonded wheels running at a high speed will, in many cases, prove profitable. Close checks should be maintained on trial wheels and the supplier informed as to their performance.

The matter of less grinding on parts should also be checked. A change in design or more care taken in a preceding operation, such as shearing or punching, often results in less grinding being required. Forging dies in poor condition, for instance, are a common cause of excessive grinding.

How to Get Increased Service from Wheels

Operators should be instructed in the proper care of wheels; more of a wheel often goes to waste in unnecessary dressing and truing than in actual grinding. Care should be taken to see that the grinding machines are kept in good condition. Worn or loose bearings, chatter, and vibration are very destructive to grinding wheel life. Machine speeds and work feeds should be observed to make certain that they are correct, as too low a speed will make a wheel act soft, and too high a speed is likely to make it act hard.

Increased value can also be obtained from wheels by using up "stubs" on higher-speed machines. In order to do this, it may sometimes be necessary to recondition the wheel in some way—by decreasing the diameter or thickness, taking off or putting on a taper, or countersinking a thick wheel to such a flange width that it may be used on a machine to which a thinner wheel is ordinarily applied.

When the bore is too large, a collar can be fitted to the spindle; and when the bore is too small, it can be increased in size. Filler collars may be made of wood or metal. Where stubs cannot be used up, the use of wheels with larger holes should be considered. Large-hole wheels are usually more economical. A way should also be found to use up obsolete wheels; they may have to be reconditioned in some such way as has been suggested for stubs.

Standardization of Wheels Lessens Cost and Stock Problems

Wheels should be standardized upon as far as practicable. Slight differences in the diameters of

wheels used for different operations in a plant, as well as differences in thickness, grit, or grade, will frequently be found to exist for no good reason. In making changes in size, the tendency should be toward larger wheels. As tapered wheels cost more than straight-sided wheels, the former should be eliminated, unless necessary for reasons of safety.

Standardization of wheels used in a plant lessens the variety and quantity of wheels that must be kept in stock and simplifies the supplying of wheels to the various departments. Sometimes it also means better purchasing terms. Whenever possible, manufacturers' standards should be adopted, as this practice is conducive to better deliveries.

The purchasing department should always be advised as to the best wheel to purchase, and the abrasive engineer should see to it that this wheel is supplied. Sometimes the wheels furnished by manufacturers are not according to specifications. A grading machine, such as the "Grade-O-Meter," made by the Abrasive Engineering Corporation, Detroit, Mich., should be useful in checking wheel specifications. The writer has employed a homemade machine which has a pointed plunger that is pressed into the wheel under test by means of a hand-lever. The pressure exerted in penetrating the wheel surface is recorded on a dial. An average of three or four readings taken on a wheel should be compared with an average of similar readings taken on a master wheel. In this manner, the hardness of the tested wheel, compared with that of the master, is determined.

Complete Records Should be Kept of Wheels

A list of the wheels used and the machines on which they are employed should be maintained. If such a list is carefully studied from time to time, it will probably be found that some of the wheels used have become obsolete and that some machines have been removed and replaced by new ones. Department and stock-room lists should be revised and kept up to date, as this practice will save time in ordering and prevent mistakes.

Another list should be made up with the diameters of wheels as the basis. Such a list will facilitate finding out when a wheel of a given size can be used or where one can be obtained for any particular machine. It will also be found especially convenient for purposes of standardization or substitution.

A Bonus System Based on Wheel Life will Interest Operators

Whenever possible, a bonus system based on the wheel life should be installed to encourage grinding machine operators. Such a system may be planned as follows: A standard time is set which indicates the number of hours that a wheel is supposed to last. If the wheel lasts longer than the standard number of hours, the operator is paid a bonus which is a percentage of his wages for the number of hours that the wheel lasts in excess of the expected life of the wheel. This bonus should be entirely separate from any bonus or piece-work system that may be used in connection with the production of the parts being ground.

If the operator uses up a wheel in a shorter time than that set by the standard, the difference in time should be deducted from his bonus time for the period under consideration. This will prevent the operator from unnecessarily dressing away a wheel on which he is sure that he will not earn a bonus, in order that he may all the sooner get a new wheel on which a bonus could be earned.

The standard time should be so set as to enable a careful operator to earn a bonus regularly. On the other hand, the amount of the bonus need not be large. It is better to have a small bonus with a reasonable chance of earning it, than a big bonus that can seldom be earned. Piece-work rates must, of course, also be set fairly, so that when a bonus is earned on wheel life, it will really be a reward for economizing on wheel wear at the same time that an operator is enabled to earn a good pay on the piece-work basis.

Effecting Economies in the Polishing Room

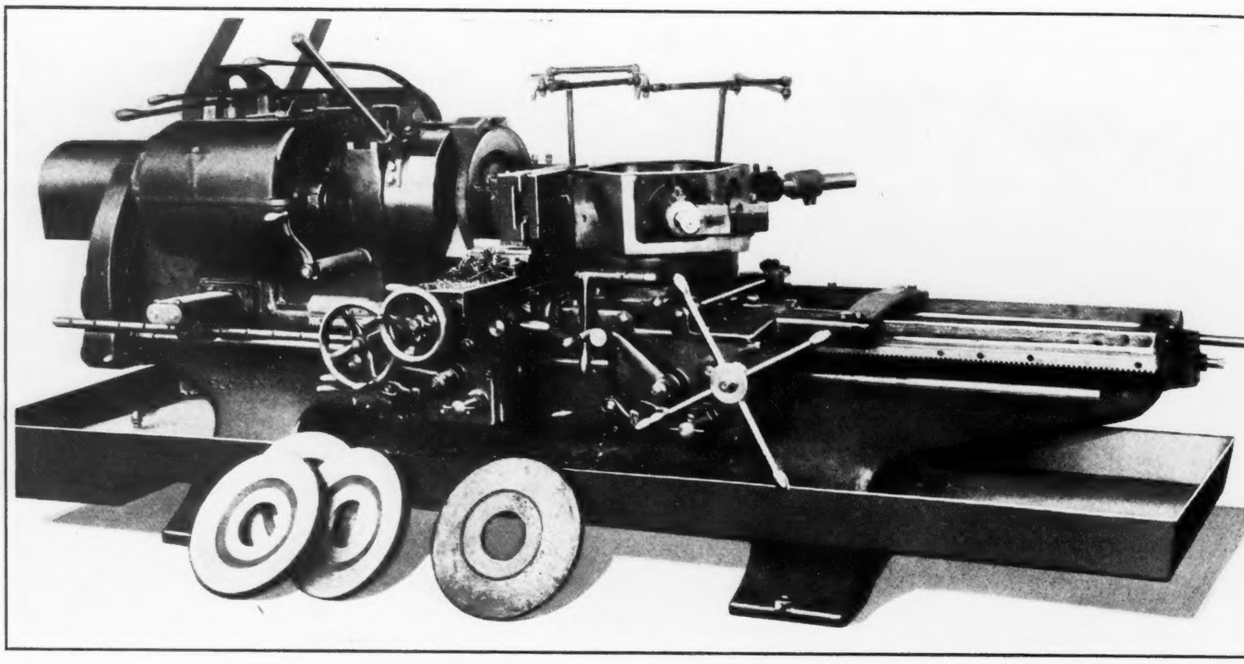
Since polishing is closely associated with grinding, the abrasive engineer should also supervise the use of buffing and polishing wheels. Proper preparation of the glue, preheating of wheels and grain, the temperature of the setting-up room and its freedom from drafts, and ample air circulation in the drying room are all points requiring close attention in order to secure low consumption of glue and grain, as well as low costs in polishing and wheel setting-up operations.

One of the most important functions of the abrasive engineer is to curb the waste of wheels by exerting his influence on the operators. If they know that the manner in which they use wheels is under observation, this will act as a deterrent against carelessness. Also, by showing his interest in getting the best wheels for the operators, the abrasive engineer will secure their cooperation in giving wheels a fair trial. This applies particularly in shops where no bonus system is in operation.

The abrasive engineer should constantly keep himself informed of every new development in grinding wheel manufacture and use, with a view to its advantageous application in the shop.

Economy of Multiple Tools

When a number of annular surfaces are to be machined on parts of small or medium size, the work can often be simplified through the use of several tools cutting simultaneously. In this way, the number of operations required are reduced and it is also possible to machine the various surfaces with closer limits of concentricity. In several articles to be published in coming numbers of MACHINERY, the first of which will appear in November, the simultaneous use of several tools grouped on one spindle will be featured. The tools and methods are of recent origin and the process is one which would be more generally applied than it is if mechanical men, in general, had a proper understanding of the possibilities of multiple tooling.



Machining Blanks for Tractor Gears

Special Tool Equipment Employed on Universal Turret Lathes for the Production of Large Ring Gear Blanks

By I. F. YEOMAN

THE machining of blanks such as shown in Fig. 1 for ring type gears used in tractor transmissions presents an interesting production problem. In one plant, this problem was solved by the development of the fixtures and tool equipment shown in the accompanying illustrations. This equipment is employed on two Foster 3-B universal turret lathes for machining the 12 1/2-inch diameter blank shown by the half-section view in Fig. 1 and for machining a similar blank of larger size having an outside diameter of 17 1/2 inches.

First Operation on Gear Blank Forging

In the heading illustration is shown the lathe set-up for the first chucking operation on the large size gear blank. The surfaces finished in this set-up are similar to the surfaces *A*, *C*, *D*, and *E* of the smaller blank shown in Fig. 1. The smaller blank is machined with practically the same equipment as the larger one. In Fig. 2 is a close-up view of the smaller blank undergoing the second machining operation performed in the first set-up. The first machining operation performed with this set-up is the rough- and finish-boring of hole *D*, Fig. 1, with the piloted boring-bar *J*, Fig. 2. The rough-boring cutter in bar *J* is followed by a finishing cutter which begins the finish-boring cut as soon as the roughing cut is completed.

After the bore *D* is finished, the tool shown in the operating position, Fig. 2, is indexed into place for machining the surfaces *A*, *B*, *C*, and *E*, Fig. 1. The surfaces *C* and *E* are straddle-faced, and the chamfer *Z* is fin-

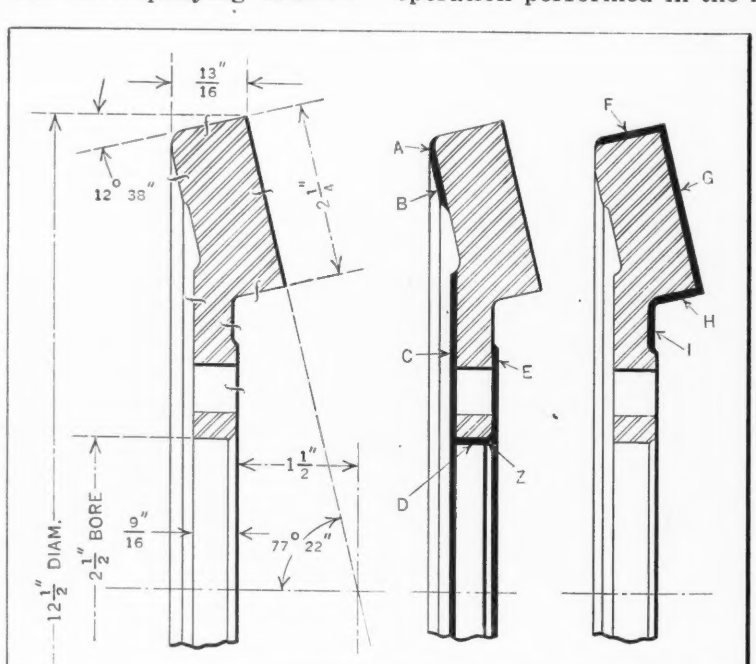


Fig. 1. Cross-sections of Tractor Gear Blank, Showing Surfaces to be Machined

ished by three cutters held in the sliding head K, Fig. 2, of this tool, while the cutter L faces the surface A, Fig. 1.

The cross-feeding movement of the sliding head is effected by the cross-slide feed of the lathe, the sliding head K, Fig. 2, being provided with lugs which engage a rail on the cross-slide of the lathe. The rail also serves as a support for the sliding head. With this construction, the power feeding movement of the cross-slide is utilized to feed head K.

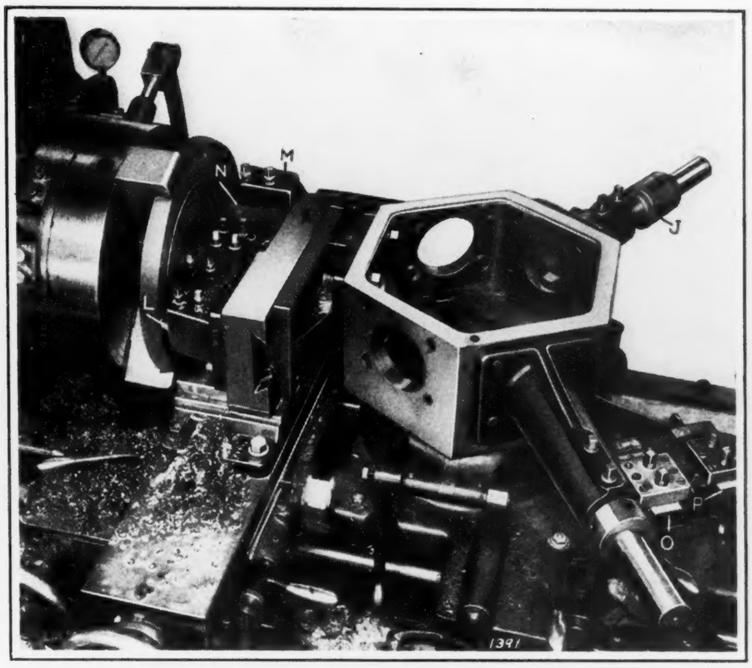


Fig. 2. Machining Surfaces A, B, C, and E, Fig. 1, with Tools Held in Sliding Heads K and M Mounted on the Lathe Turret

On the rear of the holder of the sliding head is an auxiliary slide M carrying a tool N which generates the angular surface B, Fig. 1. The longitudinal movement of slide M required to generate the angular surface, as the cross-slide feeds forward, is effected by a cam and roll. Only one roughing cut is required for this angular surface. The positions of the cutters are regulated by positive stops.

The third and final machining operation performed in the first set-up consists of finish-facing the surfaces A and C, Fig. 1, with the wide forming tools O and P, Fig. 2. The holder for these forming tools is provided with a pilot and is also supported by the rail on the cross-slide.

A hydraulically operated wrenchless chuck is used for holding the work. This chuck is operated by the cutting compound supplied under pressure by the lubricant pump. The opening and closing action of the chuck is controlled from a valve on the front of the headstock. The large gear is completed in seven minutes and the small gear in four minutes, floor-to-floor time, giving an average hourly production of 8 and 15 pieces.

Second Chucking Operation

The second chucking operation consists of rough- and finish-turning the surfaces F and G, Fig. 1, and boring the surfaces H and I. Previous to the second chucking operation, holes are drilled in the web so that the part can be driven by pins in the chucking fixture.

The machine used for the second chucking operation is a Foster universal turret lathe equipped with a flat table, as shown in Fig. 3, instead of the regular cross-slide and carriage. The hydraulic ram Q is operated by the coolant supplied under

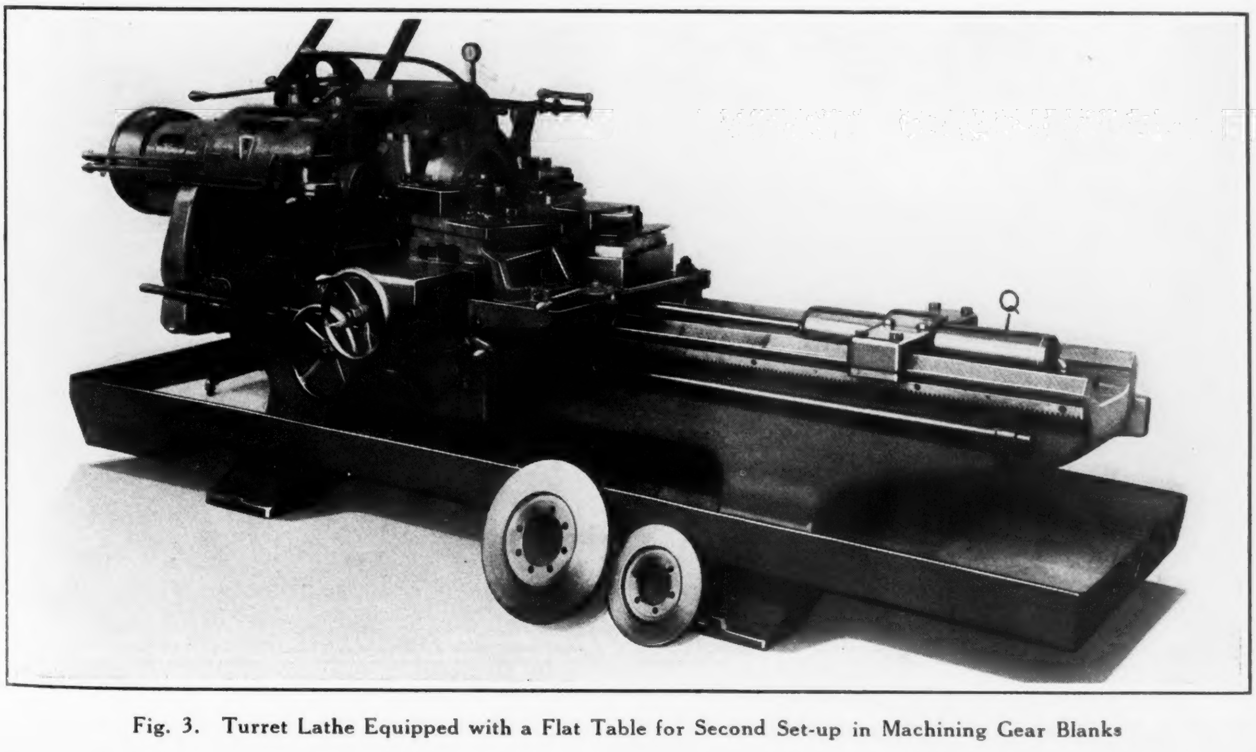


Fig. 3. Turret Lathe Equipped with a Flat Table for Second Set-up in Machining Gear Blanks

pressure by the lubricant pump. This ram provides a rapid longitudinal movement of the table for moving the tools to and from the work. The final setting of the tools to the required cutting depth is accomplished by means of a handwheel and a positive stop.

The hydraulic movements of the table are controlled by a valve operated by a hand crank on the front of the machine. The work is chucked on a draw-back type adapter, operated by a 14-inch air cylinder. A split washer *W*, Fig. 4, is used for clamping the work on the adapter.

The cutting tools are mounted on two auxiliary slides which receive their feeding movements through the power feed applied to the main cross-slide. The arrangement of the slides is clearly shown in Figs. 4 and 6. The slide *H* is dovetailed to a base attached to the rear of the cross-slide.

A taper turning attachment *J*, Fig. 6, is mounted on the flat table, and the slide-block of this attachment is joined to slide *H*. Since the taper attachment is adjusted to conform with the angular face of the gear, it is obvious that a feeding movement of the cross-slide will cause the tool to turn the face of the gear blank to the required angle.

A second auxiliary slide *K*, Fig. 4, is dovetailed to an arch-like cover over the cross-slide and is adjusted to suit the back angle at the periphery of the gear blank. The feeding motion is transmitted to this slide from an angular cam on the cross-slide of the lathe. The function of the cam in this case is merely to impart a feeding movement to the slide *K*, and it does not affect the angular setting of the slide in any way.

When this tool equipment is in operation, the hydraulic ram carries the platen and tool equipment rapidly toward the work until it is stopped just before the roughing cutters *A*, *B*, and *C*, Fig. 4, enter the work. The cutters are then set to the required depth by means of the apron handwheel, and the platen is locked in position by lever *K*, Fig. 6. The power feed is next engaged and the cross-slide moves toward the rear, carrying the cutters *A*, *B*, and *C* across the face of the work. This roughing cut is started at three points, so that a feeding movement of only one-third the width of the face is required for rough-facing the angular surface *G*, Fig. 1.

At the same time that the rough-facing operation is being performed on the angular surface, the cutter *E*, Fig. 4, rough-turns the back angle surface *F*, Fig. 1. The feed used for these operations is 0.040 inch per revolution. At the completion of the roughing operations, the feed is automatically changed through cam *L*, Fig. 6, to 0.080 inch per revolution.

At this feed cutter *D*, Fig. 4, takes the finish-generating cut on the angular face of the gear

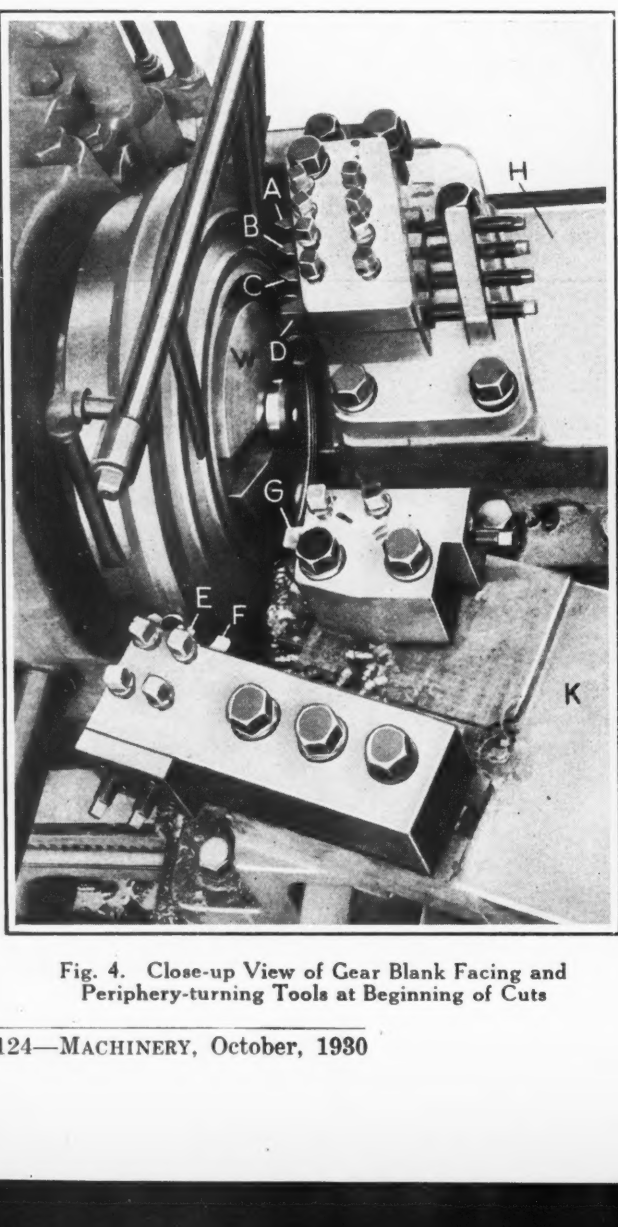


Fig. 4. Close-up View of Gear Blank Facing and Periphery-turning Tools at Beginning of Cuts

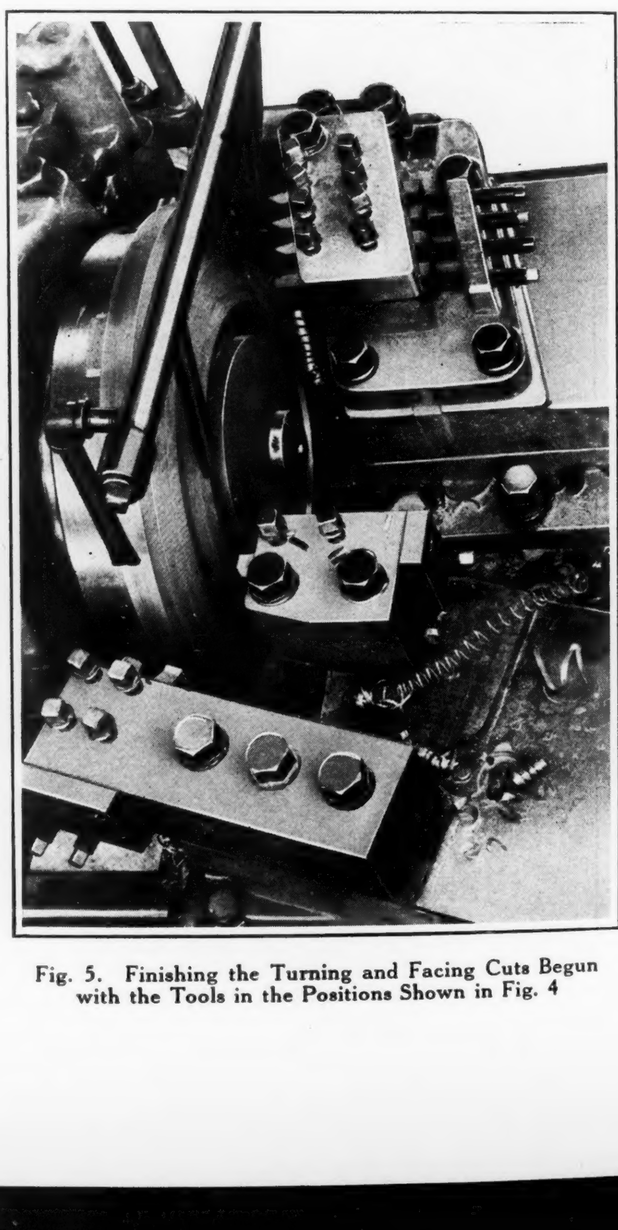


Fig. 5. Finishing the Turning and Facing Cuts Begun with the Tools in the Positions Shown in Fig. 4

blank while cutter F takes the finish-generating cut on the periphery of the blank. The cutter G serves to bore the surface H, Fig. 1, and finish the face I. At the completion of these operations, the platen is unlocked and backed away from the work through the action of the hydraulic ram. The operations on the large gear are completed in the manner described in seven minutes, floor-to-floor time, while the time for the smaller gear is four minutes.

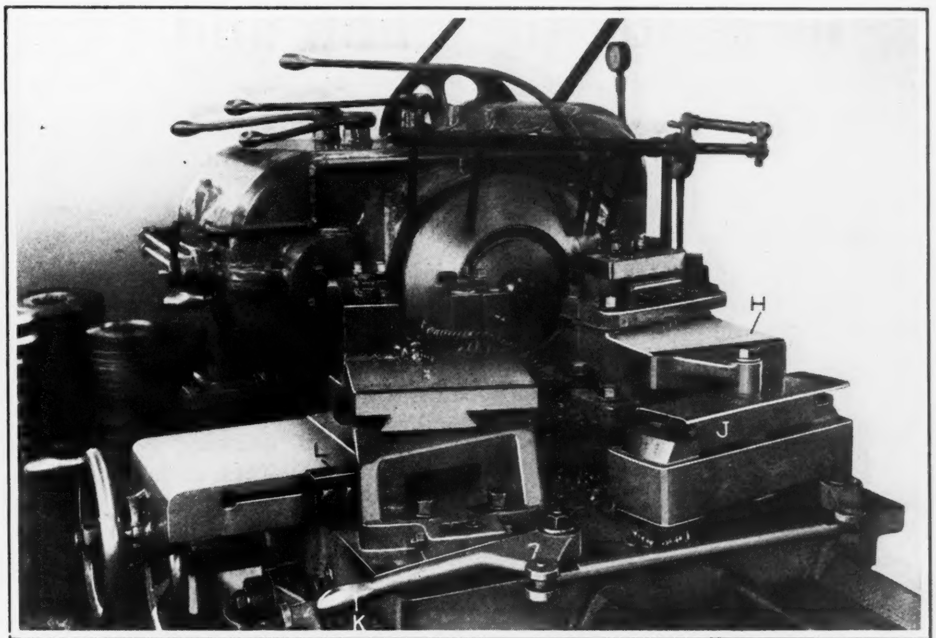


Fig. 6. Tool Equipment Shown in Figs. 4 and 5, as Viewed from the Rear End of the Lathe

The methods described may be applied, in principle, to many other parts besides gear blanks, when the operations to be performed involve turning, boring and facing operations necessitating two chuckings. Detailed descriptions of this kind suggest to the production man and tool engineer applications in widely different fields. The broad application of modern tooling equipments should, therefore, be emphasized in this connection.

A Foremen's Club that Promotes Good Will

By ERNEST L. HOLCOMB

The object of a foremen's club is to promote good fellowship. It should arouse interest in the success of the business as a whole, and in the welfare of the members. It should not only be good for the organization, but should make the work of each member easier and promote his success. It should help create and preserve an atmosphere of cooperation.

The foremen's club should be for foremen primarily, but may well include some of the higher factory executives. Assistant foremen and certain other groups may be invited on occasions when something of particular interest to them is to be discussed, but the membership should be confined to foremen and those higher in authority. This conclusion is based upon outside observation and twelve years of membership in a foremen's club that has been in successful existence for nineteen years.

The meetings of such a club should be held outside of working hours. A good idea is to have a monthly supper right after quitting time (this insures good attendance) followed by a business meeting and some kind of entertainment, either by local factory talent or by an outside speaker. It is surprising how many good speakers will give their time freely to an appreciative audience. A brief notice sent to at least one of the local papers helps to reward the speaker and adds to the interest in the club. Music of some sort during the supper, with group singing led by a member of the club, should also be a feature of the meeting.

In the club of which the writer is a member, there are no meetings from June to September, but a field day is held in June to which ladies are invited, and another outing for club members only is given in September. A Christmas celebration with dinner, music, contests, and prizes is usually held on the Saturday night after Christmas.

The club is self-supporting, and the interest taken in the meetings and outings is shown by the fact that with a membership of about sixty, the attendance has averaged well over 90 per cent during late years, with everyone present at the Christmas celebration.

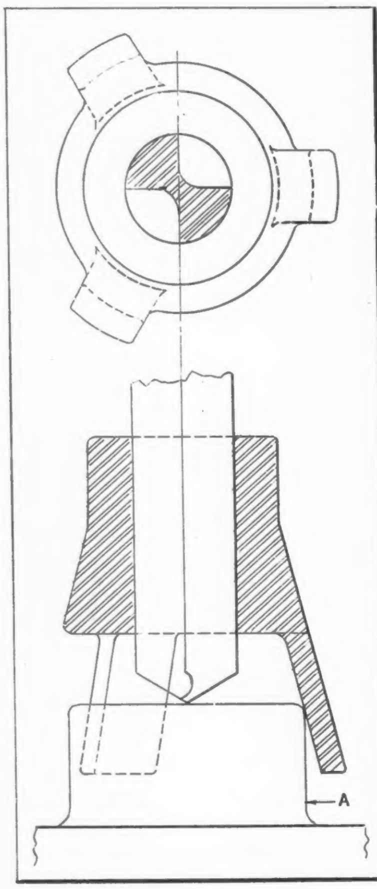
A distinct line should be drawn between the foremen's club, which is organized primarily for social purposes outside of working hours, and the foremen's conference, which is devoted to a discussion of manufacturing or business problems, and is held usually on the company's time. A club should not be organized unless enough interest is shown from the start to insure active participation by the members. Unless such participation can be counted upon, so that a definite, interesting program can be arranged from the beginning, it is better merely to call conferences to discuss temporary problems or conditions.

Ideas for the Shop and Drafting-room

Time- and Labor-saving Devices and Methods that Have been Found Useful by Men Engaged in Machine Design and Shop Work

CENTRALIZING DRILL BUSHING

Jig bushings of the type illustrated may be used to center the drill in drilling bosses on castings without laying out the work beforehand. In use, the bushing is slipped on the boss *A* as shown, and the drill is lined up approximately with the center of the hole. The spindle is next fed down until the drill, passing through the bushing, nearly touches the top of the boss; after adjusting either the drill or the work sidewise so that all three tapered prongs bear on the edge of the hub, the drill is started into the work. Any variation in the diameter of the boss is taken care of by the tapered prongs, which automatically adjust themselves to any diameter of hub that is to be drilled.



Drill Bushing which not only Centralizes the Drill but Adjusts Itself to any Variation in Work Diameter

JOSEPH E. FENNO
Bloomfield, N. J.

REDUCING SCALE OF DRAWINGS

Regular proportional dividers for reducing drawings to different scales are not available in some drafting-rooms. However, an equally effective method of doing this work is as follows:

On a sheet of tracing paper or cloth lay off a line of any known length to the same scale as used on the original drawing. If the scale of this drawing is unknown, make the length of the line equal to that of a line of some dimension on the drawing. From one extremity of this line and at any convenient angle, lay off another line. The ratio of the length of the first line to the length of the second should equal the ratio of the scale used on the original drawing to that to which the new drawing is to be made.

The ends of both lines are now connected by another straight line to form a triangle. Now, according to a theorem in geometry, any line drawn parallel to this last line and intersecting the first two lines will divide these two lines proportionally. In order to facilitate the work and to avoid drawing the parallel lines for each job, a sheet of heavy drawing paper is laid out with a series of parallel lines, closely spaced—not necessarily equally spaced—and drawn in ink for permanency. The two angular lines representing the scales of both drawings are laid out on tracing paper, and beneath it is slid the paper having the parallel lines. This paper is moved around until one of the parallel lines joins the free ends of the angular lines.

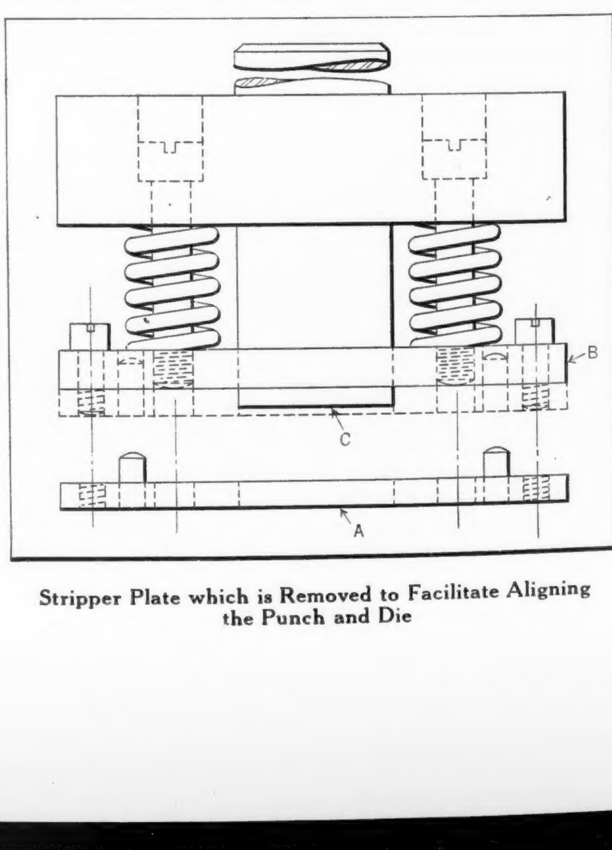
Then any length taken from the first drawing by dividers or scale and placed on its corresponding angular line may be automatically picked off from the second line in terms of the scale required for the new drawing.

Philadelphia, Pa. JOSEPH BELL

DETACHABLE STRIPPER PLATE

The accompanying illustration shows a spring stripper designed to facilitate the setting up of a punch and die. It consists chiefly of two plates *A* and *B*, the lower one being held in position by means of four screws and two dowels. In setting up the punch and die, the lower plate is removed, thus allowing the punch *C* to project far enough from the bottom of plate *B* to align the punch with the die opening.

Philadelphia, Pa. HUBERT R. SCHMIDT



Stripper Plate which is Removed to Facilitate Aligning the Punch and Die

APPEARANCE OF DRAWINGS

Most draftsmen like to produce good-looking drawings—so much so that they sometimes overlook the purpose for which the drawing is made. The main requirement is that it should be easy to read. Dimensions and notes on the drawing should be large and clear. Free-hand sketching and a disregard of appearance in favor of legibility of figures and letters should be encouraged. The dimensions and notes on the drawing are of far greater importance to the shop than appearance. A rough sketch with large, clear, legible dimensions and notes is a much more practical drawing for shop use than a neat, fancy print, with small letters and figures that are easily obliterated by oil and grease.

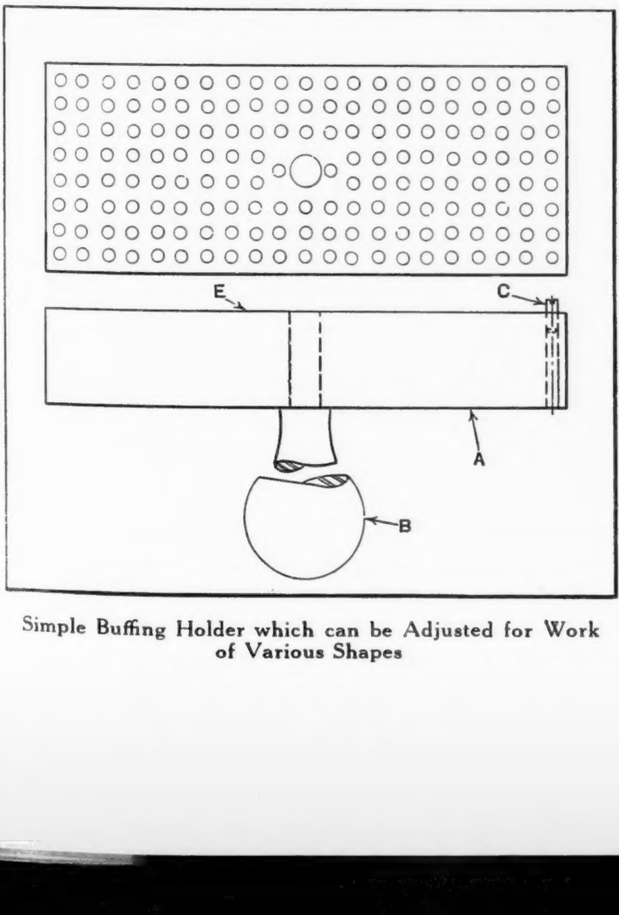
Philadelphia, Pa. HARRY KAUFMAN

UNIVERSAL BUFFING HOLDER FOR FLAT WORK

In buffing flat and comparatively thin pieces, it is usually necessary to construct special holders for supporting the work against the wheel. With the design shown in the illustration, however, it is possible to use the same holder for several different pieces. This holder consists chiefly of a cast-iron plate *A* to which is attached a handle *B*. In the plate are drilled and tapped numerous holes to receive screw-pins like the one shown at *C*.

For buffing work of irregular contour, the work is placed on the face *E* in a suitable position. Several pins *C* are then inserted in holes adjacent to the edge of the work and located so that the work is confined during the buffing operation. While buffing, the operator grips the holder by means of the handle *B*. It is obvious that after the pins have been set for the first piece, the remaining pieces in the lot can be finished without further adjustment.

Boston, Mass. CHARLES R. WHITEHOUSE

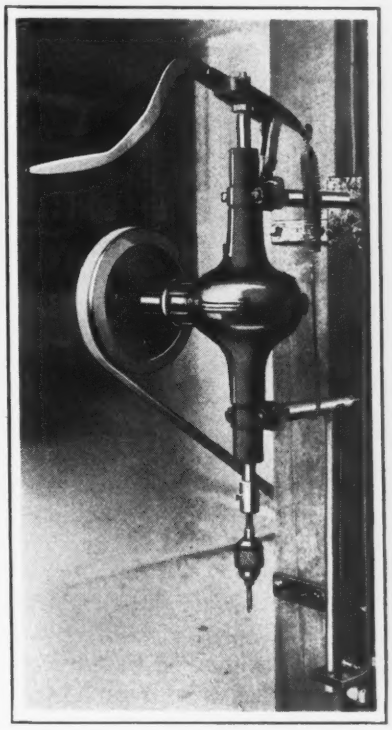


Simple Buffing Holder which can be Adjusted for Work of Various Shapes

DRILL PRESS MADE FROM FORD REAR AXLE

With the exception of the driving pulley and the supporting frame, the improvised drill press shown in the accompanying illustration was built from the rear axle of a Ford automobile. The axle housings were cut off about 18 inches from the center of the differential housing. The ends were bored out in the lathe to receive the standard roller bearings used on the outer ends of the axle and the regular Ford axle turned down so that it would pass through both bearings. A keyway was also cut in the shaft to provide for the drive.

The axle was passed through the two main gears of the differential proper. The pinions of the differential were spot-welded together and the two keys in the main gears were spot-welded in place—otherwise, the differential proper and the ring gear were left unchanged. The propeller shaft regularly used in the car was cut off at a point just outside the main bearing. A collar was placed over the outside and against the driving shaft bearing housing to keep the ring gear and the pinion properly meshed. The driving pulley was then attached to the propeller shaft. When completed, the spindle was supported by four roller bearings and the driving shaft by one roller bearing, thus making the drill press anti-friction bearing equipped throughout.



Rear Axle of a Ford Automobile Converted into a Drill Press

The completed machine is used for drilling holes through flat stock and plates, and it has proved to be very powerful and efficient. The writer has seen many devices that were made up from Ford parts, but this is the first example of a machine tool made in this way. For a rough-and-ready drill press at a very low cost the converted Ford rear axle is in a class by itself.

Elkhart, Ind. I. F. YEOMAN

* * *

A revised Simplified Practice Recommendation No. 51 of the Bureau of Standards, Division of Simplified Practice, Washington, D. C., on die-head chasers is now available. It may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents a copy.

Questions and Answers

LAW REQUIRING WORD "PATENTED" TO BE AFFIXED TO AN ARTICLE

L. R. A.—Please explain in detail the provision in the patent law requiring a manufacturer to affix the word "patented," together with the number of the patent, on patented articles manufactured.

Answered by Leo T. Parker, Attorney at Law, Cincinnati, Ohio

The law specifies that, with respect to all patents issued after April 1, 1927, it shall be the duty of all patentees and their assigns and legal representatives, and of all persons making or vending any patented article for them, to give notice of the existence of the patent, either by affixing the word "patent," together with the number of the patent, or, if this cannot be done, by affixing to it, or the package containing one or more of the patented articles, a label containing such a notice. The law states further that in any suit for infringement by the party failing so to mark his patented product, no damages shall be recovered from an infringer except on proof that the latter was duly notified of the infringement and continued after such notice to make, use, or vend the patented article.

In other words, manufacturers and sellers of patented articles are required to follow the law to the letter. Although a patentee may mark his articles "Patented" or "Patented April 3, 1930" (or other date after April 1, 1927), he cannot obtain damages from an infringer unless the latter continues to make, sell, or use the patented product after receiving notification of the infringement from the patentee or his authorized representative.

However, articles manufactured and sold under a patent issued prior to April 1, 1927, may be marked "Patented," either giving the number of the patent or the date on which the patent was issued. If a patentee fails to mark the articles that he manufactures or sells under a patent issued prior to April 1, 1927, in the manner specified, an infringer is liable in damages only for such devices as he may make, sell, or use after receiving notification from the patentee or other authorized person to discontinue further infringement. Therefore, it is apparent that the legal form of marking patented articles is dependent upon when the patent was issued.

However, the legal interpretation of the law does not require a patentee to make, sell, or use his invention. The law applies only to such patented articles as are being manufactured, used, or sold. Therefore, a patentee who "shelves" his invention may institute legal proceedings against an infringer and obtain damages, even if the latter was not notified to discontinue the infringement.

A patent grant gives to its owner the exclusive right to make, sell, or use the invention. The only available method by which an infringer can avoid liability is to show that in some manner the patentee performed acts in direct violation of the law.

DETERMINING THE "OILINESS" OF OILS

H. G.—Is there any satisfactory means of determining whether or not one oil is more "oily" or "adhesive" than another?

Answered by H. L. Kauffman, Denver, Colo.

The answer is "No." On this subject Wilson and Barnard had the following to say in a paper, "The Significance of Various Tests Applied to Motor Oils," presented at the thirty-first annual meeting of the American Society for Testing Materials held at Atlantic City, N. J., in 1928:

"While it has been definitely proved that there is no appreciable difference between the performance of animal and vegetable oils, as compared with straight mineral oils of the same viscosity in the ordinary operation of bearings or other well lubricated surfaces, it has also been established that there are differences between such oils in their ability to adhere to surfaces and to lower the friction under severe conditions of heavy loads and slow speeds.

"The differences between the behavior of such oils under these abnormal conditions is considered to be an indication of the 'oiliness' of the oil, which undoubtedly is dependent upon its ability to be absorbed by metal surfaces. With the exception of the lubrication of the bands of a planetary transmission, it has not been definitely demonstrated that oil of high 'oiliness' is of any real advantage in the operation of a machine, and, unfortunately, almost all the materials that might be used to increase the 'oiliness' of a mineral oil have other serious drawbacks to their use—particularly the tendency to form stiff emulsions or to separate out sludgy material in service.

"Partly for this reason and partly because of the inherent difficulties in measuring quantitatively the rather elusive properties of 'oiliness,' there is no satisfactory test for reproducibly measuring moderate differences, though several methods have been devised to show up large differences between different oils."

SHAPE OF WORM THREADS

J. H. W.—What are the practical advantages of the curved forms of worm threads used quite generally for truck and bus drives?—This question is submitted to MACHINERY'S readers.

The Fundamentals of Machine Polishing*

The Proper Selection of Wheels, Abrasives, Machines, Speeds, and Work-holding Fixtures is Necessary to Obtain the Best Results in Machine Polishing

By ROBERT T. KENT, Director of Engineering, Divine Bros. Co., Utica, N. Y.

THE term "polishing" applies to the production of a smooth surface on metal by means of an abrasive wheel, more or less flexible, the abrasive being glued to the face of the wheel which may be made of canvas, muslin, leather, etc. Polishing follows grinding and should properly be termed "flexible grinding." The term "buffing" is applied to the production of a luster on a polished surface by means of an abrasive composition bonded with a wax or grease smeared on the face of a buffing wheel made up of a series of cloth disks. The terms "polishing" and "buffing" thus have entirely different meanings, although they are often incorrectly interchanged.

The success of machine polishing depends on a consideration of many variable factors, including the character of the work, the polishing wheel employed, the abrasive, the glue used to apply the abrasive to the polishing wheel, the machine employed, the fixture used to hold the work, the speed of the polishing wheel, and the rate at which the work is fed past the wheel.

Importance of Using Abrasive of Proper Size

The size of the abrasive grain required depends largely on the condition of the surface to be polished. For the initial polishing operations, the abrasive should be large enough to get down to the bottom of the deepest scratch or pit and to reduce the surrounding metal to the same level. Finer abrasives are then used successively until the one finally employed produces the desired surface. It is a mistake, however, to use an abrasive coarser than is necessary for the first operations, as it produces scratches on the work that the following wheels with finer abrasives must remove. The initial investment and the operating cost may be much greater than necessary because of unwise selection of abrasives.

The type of wheel to be used depends largely on the contour of the work. A plain surface calls for a hard, somewhat rigid wheel, while a curved contour calls for a softer, flexible wheel that will fit itself to the surface to be polished. The speed of the work past the polishing wheel is determined by the finish required. The slower the work is fed past the wheel, the better will be the finish.

Number of Wheels Required in Machine Polishing

Once the work has passed a wheel in a polishing machine, that particular wheel is through with the work, whereas in hand polishing, the work can be applied to the wheel as many times as is necessary to produce the desired finish. Hence, machine polishing usually calls for a larger number of wheels than hand polishing. For example, if hand polishing produces a satisfactory finish by first passing the work four times over a certain wheel set up with a No. 90 abrasive and then twice over a wheel set up with No. 120 abrasive, it will probably be necessary to equip the polishing machine with six wheels in order to produce the same finish. However, experience fails as a guide on this point, and the laboratory should be called upon to determine how many wheels are necessary.

The following is an abbreviated list of abrasives that have proved suitable for some of the more common metals: Steel, Alundum; cast iron, Crystolon; aluminum, Turkish emery; duralumin, Turkish emery; brass, Alundum; copper, Turkish emery.

Polishing Work from Forge Shop or Rolling Mill

Work that comes directly from the forge shop or rolling mill, such as automobile bumpers or steel shapes, is coated with mill scale, and may, perhaps, be deeply pitted. The mill scale is hard and difficult for the polishing wheel to break. It will clog the wheel and render it ineffective in a short time. Deep pits require the polishing wheels to remove all the surface metal down to the bottom of the deepest pit. These difficulties impose burdens on the wheels that can be readily lessened by tumbling or pickling, provided the latter operations are performed properly.

When the surface of the work is uniformly covered with hard scale or oxide, the polishing wheel may become dull or clogged in a very short time, so that its efficiency is greatly reduced. The condition of the original surface is therefore an item of major importance in machine polishing.

If a clean uniform surface is not provided in the beginning, the polishing wheel must produce one. It follows, then, that the better the original surface, the lower will be the investment in machinery and polishing wheels, and the lower will be the labor cost for the polishing operation.

Strict adherence to material specifications, rigid inspection, and liberal rejections of poor stock may therefore be necessary to insure a product having the desired polish. Polishing methods that have proved entirely satisfactory may suddenly fail to give the desired finish because of a change in the material used for the product.

If the work is to be held within close tolerances, the material entering into the construction of the

*Abstract of a paper presented at the National Machine Shop Practice Division Meeting of the American Society of Mechanical Engineers in Chicago, September 23-24.

wheels must be considered. A soft wheel will "flex" on the work and produce uneven surfaces. This limits the choice of the wheel to practically two types, namely, the compressed leather and the compressed canvas wheels. As both of these wheels may be made to extremely hard densities, it is a comparatively simple matter to maintain close tolerances with them.

Polishing wheels generally operate at from 1800 to 2500 revolutions per minute, depending on the diameter. The wheel should be trued up at its operating speed; otherwise, the distortion that occurs at high speed will result in a surface that is no longer cylindrical when it comes in contact with the work. A properly trued wheel may not be smooth and cylindrical until brought up to working speed.

Characteristics of Polishing Machines

The polishing machine should be designed to maintain a constant peripheral speed of the polishing wheel as close as possible to 7500 surface feet per minute. An increase in the speed of the wheel would increase the efficiency of the cutting action momentarily, but would generate so much heat as to soften the glue and thereby permit the abrasive to be torn from the wheel before rendering full service. Then, again, speeds that may be entirely safe for the wheel may develop enough heat to injure the work. For instance, die-castings or other alloys of zinc may be melted or distorted if the wheel speed is too high. Other metals may suffer changes in temper, hardness, etc., as a result of the heat generated by excessive wheel speed.

Care of Polishing Wheels

The polishing wheel should never be operated after the abrasive head has worn through to the fabric of which the wheel is composed. Otherwise, it will burn and require trimming, which means a reduction in diameter, with subsequent reduction in peripheral speed.

In setting up the wheel, a protective head of glue should be placed on it before the glue that holds the abrasive is applied. As soon as the wheel wears down to the protective head, it should be removed from service, the old abrasive renewed, and a new head applied. With this treatment, the diameter of the wheel should be maintained fairly constant for a period of years, and no provision need be made for a change in spindle speed due to wheel wear. On the other hand, if the polishing machine is to be used for a variety of work requiring different sizes of wheels, and therefore different spindle speeds, provision should be made for changing the speed with changes in wheel diameter.

Determining Speed of the Work Past the Wheel

The speed of the work past the wheel depends on the material and the degree of finish required and varies between wide limits. Strip zinc can be fed past the wheels at the rate of 200 lineal feet per minute, whereas 15 feet per minute is a high rate for stainless steel. The speed at which separate pieces can be loaded on the machine may be the factor that determines the production capacity of a polishing machine.

Effect of Wheel Pressure on the Work

It is highly important that provision be made for regulating the pressure with which the polishing wheels bear on the work. Excessive pressure causes rapid destruction of the abrasive head, excessive heat, and eventual burning of the wheels. As regards the work, the heat generated by the high pressure in some classes of work may change the character of the metal and render it useless for its purpose. In any event, excessive pressure greatly increases the operating cost, as it wastes the abrasive, the glue, and the labor for setting up the wheels, and also makes it necessary to perform more operations on the work, owing to the decreased efficiency of the highly heated wheels.

Provision for Oscillating the Wheel-spindle or Work-table

In hand polishing, the workman handles the work in such a manner as to "cross the scratches"—that is, he presents the work to the wheels at varying angles, so that wheel marks intersect and thus tend to obliterate each other. In most cases of machine polishing, and particularly in straight-line work, it is desirable to approximate this effect by moving either the wheel or the work transversely relative to the line of travel of the work past the wheel. Without such an oscillating movement, each wheel tends to follow in the marks left by the preceding wheel and to deepen instead of cut out the marks.

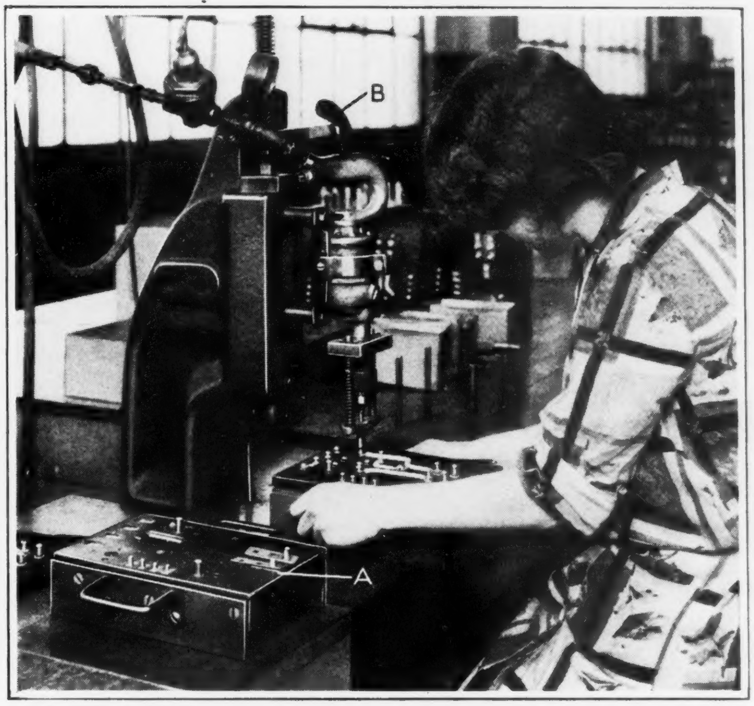
Providing a Cushion Under the Work

In some classes of work, it may be desirable to divide the "cushion" required for flexible grinding between the wheel and the work. The wheel is made of the proper density and cushion to give the desired finish, and a cushion surface is provided under the work to enable it to "give" or recede sufficiently to take care of slight variations in contour that would cause the wheel to cut deeper were it not possible for the work to recede somewhat from the wheel.

The cushion effect can be provided by means of a resilient material, such as a canvas or leather belt or springs. The greater the cushioning effect, the less accurate will be the surface, so far as dimensions are concerned. Hence, it follows that on highly accurate work, where the dimensions must be held within close limits or corners and edges kept sharp, little or no cushion should be provided under the work. On the other hand, where the work need not be held to close limits and where the shape may be slightly irregular, production is greatly facilitated by providing the proper amount of "cushion." Additional information on this subject, together with examples of polishing machines, will be presented in a coming number of MACHINERY.

Air Drill on Foot Press Speeds up Screwdriving

Assembling operations on small electrical equipment panels made by the Allen-Bradley Co., Milwaukee, Wis., are expedited through the use of fixtures and a foot press equipped with a portable air drill. One of the fixtures is shown at *A* in the illustration. The parts to be assembled on one side of the panel are placed in cavities in the top side of the fixture, as well as nuts which may be required for the screws which are to be driven. Then the panel is placed on top of the parts, and the screws are inserted loosely in the holes of the panel or of the top parts.



High-speed Assembling Operation in which Use is Made of a Pneumatic Drill in Connection with a Foot Press

After the screws have been inserted in the different holes, the fixture with the panel on it is passed to the girl who operates the foot press. This girl rapidly drives the screws tight by merely depressing the foot-treadle of the machine. Each time that the treadle is depressed, the ram of the machine descends and brings the screwdriving tool, which is held in the chuck of the drill, down into the slot of the screw beneath it.

At every downward movement of the ram, lever *B* strikes a bar attached to the press frame. This lever is connected to the valve of the air drill, and hence when the lever is operated, the valve is opened to admit air for revolving the screwdriver. The valve remains open until the lever is released on the up stroke of the ram.

A relief valve on the air line is set to a predetermined pressure, and the screws are driven tight until the tool stalls. If this does not occur, the operator knows that the threads of the nut or screw have stripped off because of defects. An advantage of the operation, in addition to speed, is that all the screws are driven to practically the same degree of tightness. Three girls are kept busy loading fixtures for this operation. Fixtures are used for both panel sides.

Pratt & Whitney Co. Celebrates Seventieth Anniversary

On October 1, the Pratt & Whitney Co., Hartford, Conn., celebrated its seventieth anniversary. The celebration took the form of a reunion of former employes of the company. Clayton R. Burt, president, held open house at the plant, welcoming all the Pratt & Whitney men who were able to attend. The plant was open for inspection during the afternoon. In the evening, the company honored all the Pratt & Whitney men who had served the company twenty years or more by a banquet given at the Hartford Club. Many outstanding men of the machine tool industry were invited to attend. Some four hundred people were present at the evening function.

It was in 1860 that Francis A. Pratt and Amos Whitney, at that time young machinists in Hartford, decided to embark on an enterprise of their own. At first they rented a single unpretentious room in Potter St., where, after working hours, they built machines of their own design. This was the modest beginning of the Pratt & Whitney Co. At that time those two young men would have had difficulty in visualizing the great plant that was to grow out of their early ambition—a plant covering a great many acres and employing over two thousand people.

* * *

According to *Facts and Figures of the Automobile Industry*, published by the National Automobile Chamber of Commerce, the automobile industry employs approximately 4,000,000 people in normal periods. This includes all those engaged in making and selling motor vehicles, parts, accessories, and tires, as well as garage and repair shop employes and professional passenger car and truck drivers. In addition, some 700,000 people employed in the gasoline industry and in the building and maintenance of highways, may be said to owe their livelihood to this industry.

Removing Scale and Rust by a New Process

Convenience of Operation, Rapid Action and Thoroughly Cleaned Surfaces Characterize the Bullard-Dunn Process of Removing Scale and Rust from Metal Surfaces

A NEW method of removing scale and oxides from metal surfaces by the action of hydrogen, electrically generated on the surface of the metal beneath the scale or oxide, has been developed by the Bullard Co., Bridgeport, Conn. This method is patented and is known as the Bullard-Dunn process.

The outstanding feature of the process is that the cleaned surfaces of the original metal are not chemically attacked to cause erosion, no matter how long an object is immersed in the cleaning solution. The protection of the surface against pitting, etching, and hydrogen embrittlement is accomplished by a lead film which is instantaneously applied to the cleaned spots on the surface of the metal as soon as the scale or oxide is removed. This may be said to be the essence of the process. In addition, a marked feature of the method is its ability to reach and thoroughly clean recessed surfaces that are inaccessible by mechanical cleaning methods such as sand-blasting or scratch-brushing.

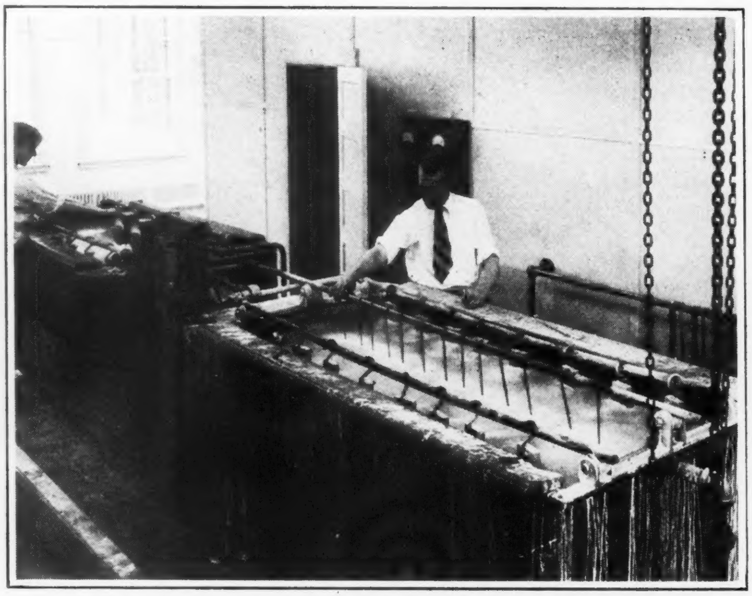


Fig. 1. Acid and Alkaline Baths Used in the Bullard-Dunn Electro-chemical Cleaning Process

Among other advantages of the process should be mentioned its simplicity of operation. Any ordinary shop man, after receiving brief instructions, can produce satisfactory results. Neither the composition of the cleaning baths, their temperature, nor their operation, requires close control within accurate limits. Satisfactory results are obtained as long as the main principle of the process is observed.

This principle involves the use of an electrochemical bath consisting of a mixture of sulphuric and hydrochloric acid with lead anodes. A second (alkaline) cleaning bath is also generally employed in connection with the process; this bath consists of caustic soda and trisodium phosphate with lead and iron anodes. In addition, hot and cold rinsing tanks are required.

When only scale or oxide is to be removed, the tank with the sulphuric-hydrochloric acid bath, together with the rinsing tanks, is all that is required. When grease and dirt are also to be removed, the object to be cleaned is first immersed in the alkaline (caustic soda-trisodium phosphate) bath, which removes the grease and dirt, and is then placed in the acid bath, which removes the scale and rust. If the protective lead coating already mentioned is objectionable on the cleaned object, it may be quickly removed by immersing the object in the alkaline bath and reversing the current. The general arrangement of the acid and alkaline tanks is shown in Fig. 1.

At the present time the process has been applied mainly to objects of iron and steel, but its application can be extended to include other metals.

How the Process was Developed

Four years ago, the Bullard Co. began the manufacture of bumper bars for automobiles. One of the problems encountered was that of removing the black scale formed on the bumper bar parts during the heat-treatment. The parts could not be polished satisfactorily or economically until this scale had been completely removed. All the ordinary methods of removing scale, such as tumbling, sand-rolling, sand-blasting, pickling, and electro-pickling, were tried, but did not give satisfactory results. During the research work inaugurated to find a method that would remove the scale completely, the process described was developed. In addition to being effective, it was also found to be unusually economical.

Present Application of the Process

At the present time, the process is used to a large extent in the Bullard plant for cleaning all surfaces of heat-treated alloy steel parts entering into the construction of vertical turret lathes and Mult-Au-Matics. Among the incidental advantages gained have been a marked improvement in the ease of machining parts after heat-treatment and a greatly extended tool life because of longer runs between grindings. The absence of highly abrasive scale

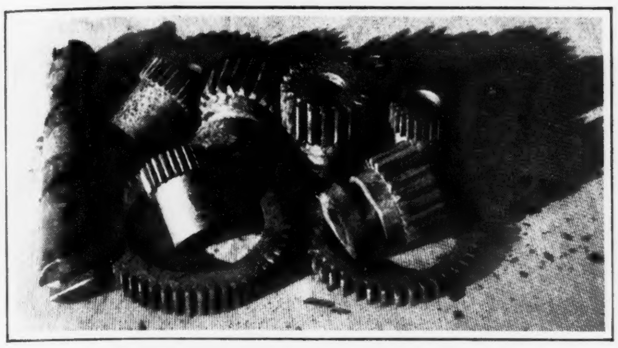


Fig. 2. A Collection of Gears and Machine Parts after Heat-treatment, Showing Scale and Dirt; These Parts are Ready for the Cleaning Bath

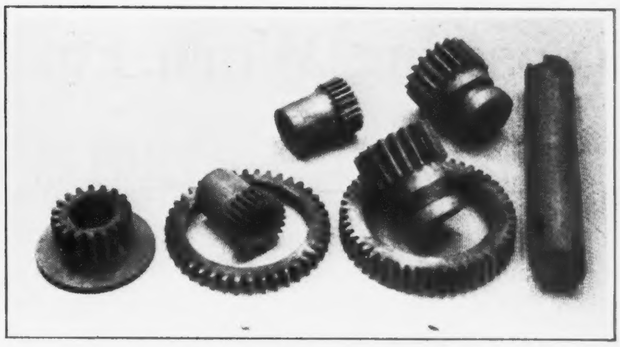


Fig. 3. Gears and Machine Parts after Having Been Cleaned—Time Required for Cleaning was from 5 to 10 Minutes

and oxides is the cause of this. In addition, savings in time and labor are made when subsequent polishing operations are required.

The original contours and dimensions of accurately machined parts such as gear teeth, splined shafts, keyways, and screw threads are not affected by the cleaning treatment. This makes it especially applicable to the cleaning of machine parts preparatory to the final finishing or assembling operations. It is also used for the cleaning of small metal-cutting tools such as milling cutters, drills, reamers, taps, and dies after heat-treatment. In the automobile industry, it may be used for such parts as transmissions, differentials, and gears and forgings of various kinds, as well as for parts to be electroplated.

It is of especial interest to note that in the cleaning of casehardened articles, the casehardened surface is not affected by the cleaning bath. Owing to the protective lead coating, the surface remains as hard as when it comes from the quenching bath.

Using the Process for Cleaning Drawn Sheet Metal after Annealing

Another application of this cleaning process which is of particular value is in the metal-stamping field, especially for deep drawing operations, where the scale formed during each annealing is detrimental to the life of dies and punches, as well as to the finish of the work. The drawing operations are facilitated by the lubricating effect of the lead coating resulting from the cleaning process. In the press shop toolroom, the process also finds application because it simplifies the cleaning of intricate dies after heat-treatment.

In the fabrication of stainless steel, there is a formation of chromic oxide from each annealing operation. This oxide is particularly harmful to dies and tools, and greatly increases the time and labor required for subsequent forming or polishing operations. A thorough removal of the oxide increases the life of tools and dies materially. The process also finds application in drop-forging plants. One of its advantages is that it makes it easy to detect such inherent defects as cracks in forgings and "pipes" and "seams" in bar stock, as well as hardening cracks in heat-treated parts. Such defects show up clearly after the cleaning process. It can be easily applied to the cleaning of parts ranging in size from small screws and nuts to large gears, shafts, and forgings.

As a preliminary to electroplating operations, the process has proved of very definite value in the Bullard plant. It produces thoroughly cleaned surfaces upon which the electrolytically deposited metal will spread more uniformly. The salt-spray tests used by the Bureau of Standards have proved definitely that electroplating on surfaces free from scale and oxide is less porous than when the surfaces are not clean.

While this method is patented, the Bullard Co. is prepared to license manufacturers to make use of the process in their own plants.

* * *

RAILWAY TOOL FOREMEN'S MEETING

The American Railway Tool Foremen's Association held its annual convention in Chicago, with headquarters at the Hotel Sherman, September 10 to 12. A number of papers of direct interest and value to railway shop executives were presented. H. N. Anderson of the Acme Machinery Co., Cleveland, Ohio, spoke on "Forging Machine Dies," and A. H. d'Arcambal of the Pratt & Whitney Co., Hartford, Conn., presented a paper on "Heat-treatment of Steel." Reports were presented on the following subjects: Tools and methods for mass production; tools for maintaining automotive equipment; and testing devices for pneumatic tools. The standardization committee also made a report.

Fig. 4. A Forged Shovel before and after the Application of the Bullard-Dunn Cleaning Process—Time Required for Cleaning, 5 Minutes

Repairing Worn Parts by Electrodeposition*

Recently Developed Method for Salvaging Worn or Erroneously Machined Steel Parts, Such as Gages, Reamers, and Shafts, by the Electrodeposition of Iron

By T. P. THOMAS, Research Engineering Department, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

IN the last few years, considerable attention has been given to a new means of salvaging machine parts that are under size, due either to wear in service or to errors in manufacture. The reclamation of such material by applying an adherent coating of electrolytic iron began in England and France during the war. The British were the first to make practical application of the electrodeposition of iron for this purpose, applying it to the repair of worn automobile and airplane parts.

The Westinghouse Research Laboratory became interested in this problem and has worked on it for several years. A standard method of procedure has been developed which makes use of commercial salts and sufficiently high current density so that all ordinary repairs will not require more than two or three hours in the plating bath. The cost of building up and machining are thus kept low enough so that it generally pays to reclaim a piece rather than to use a new one.

Plating Solution to be Employed

For general repair work, a plating bath made up in the following proportions is satisfactory: Commercial ferrous ammonium sulphate, or the proportional amount of ferrous sulphate and ammonium sulphate, 2.5 pounds per gallon of water, plus a small amount of ferrous carbonate freshly precipitated and kept under water, plus a small amount of powdered charcoal. The carbonate "mud" keeps the solution practically neutral. The charcoal prevents pitting at the cathode surface. The sulphate salts must be free from sulfocyanates.

Small pieces are plated in earthenware crocks and large ones in lead-lined wood tanks or stoneware tanks. Difficulty is experienced in using the plating solution in a wood tank, as organic materials from the wood enter the plating solution and cause excessive pitting of the deposit. The anodes are made of Armco iron, cylindrical in shape. Micarta disks with a hole cut in the center are fitted in each end of the anodes.

The pieces to be plated are made the cathode and held stationary as they extend into the plating solution through the holes in the micarta disks. The anodes are attached to a suitable device designed to move them up and down, thus keeping the plating solution agitated and the ferrous carbonate and charcoal in suspension. The temperature of the bath is held at approximately 60 degrees C. (140 degrees F.). A current density of 60 to 65 amperes per square foot is used. This deposits metal at the rate of 0.006 inch in diameter per hour. This method of procedure applies to pieces such as shafts, plug gages, reamers, pins, etc. For pieces such as gear centers, where the inside diameter is to be reduced, the anode passes up and down through the center and micarta rings are attached to it to produce stirring of the plating solution.

Thorough Cleaning before Plating is Essential

Probably the most essential part of the process, and the step that requires the most careful attention, is the cleaning of the piece before plating. After trying different methods of cleaning with the object of obtaining good adherence of the deposited metal, the electrolytic process was adopted as follows: The piece to be plated is made the cathode in an alkaline solution consisting of 5 to 10 per cent of caustic soda and 5 to 10 per cent of commercial sodium carbonate, using a current density of 3 amperes per square inch, for a period of three minutes. It is then washed in running water and transferred to a 30 per cent commercial sulphuric acid solution, a high enough current density being used to make it passive. This treatment is continued for a period of three minutes or longer, according to the condition of the piece. If it is free from rust in starting, three minutes is sufficient.

The piece being cleaned should come out of the acid cleaning solution bright and silvery, except in the case of cast iron, which will be black due to the presence of graphite. When taken from the acid cleaning solution, the piece is washed in running water and immediately transferred to the plating bath without the cleaned surface being touched. It is essential that the current density be held high enough, at least 3 amperes per square inch in the acid solution, so that the piece being cleaned remains passive. When passive, there is a rapid evolution of gas with the piece remaining bright, but if allowed to become active, it has a dull black appearance. When a piece is coated with oil or grease, it is cleaned with gasoline or benzine prior to cleaning it electrolytically.

How to Protect Parts Not to be Plated

Portions of the work that are not to be plated but that will come in contact with the solution are brushed over with melted hydroline of a melting point sufficiently high to stand immersion at 140 degrees F. without undue softening. After the piece is plated, the protective coat can be readily removed by washing with benzine.

It is impossible to build up a piece accurately to size; therefore it is necessary to plate a few thousandths inch over size, and then grind to the finished size.

*Paper presented before the Machine Shop Practice Division of the American Society of Mechanical Engineers at Chicago, September 24.

Applications of the Electrodeposition Method

This method of recovery can be applied to steel, cast iron, or casehardened material. Press fits, severe bending, and forging tests with deposits 1/16 inch or more thick all indicate that platings produced in this manner are anchored satisfactorily to the base metal. Plug and thread gages have been repaired and have given satisfaction, although they are not so hard as heat-treated tool steel. Such pieces can, of course, be carburized, and they then compare favorably with the original gages.

An interesting test was made on the shaft from a three-horsepower motor which was used on a six-spindle drill press with a rather short, very tight belt. This shaft was ground under size to simulate wear, then plated over size, ground, and reassembled. It ran steadily on the day shift for eight months and was then taken out for inspection. No wear could be detected. As this shaft had had more than a thousand hours of actual service, it is quite evident that this material is all that can be desired for bearing service.

The limiting factor in the size of a plating plant is the amount of current needed for cleaning. At the rate of 3 amperes per square inch, a 1000-ampere generator set would clean a piece having 333 square inches of surface—the equivalent of a shaft 4 inches in diameter and 26 inches of plating length or a shaft 6 inches in diameter and 17 inches of plating length. After a repair shop of this kind has been equipped, the chief operating expense is labor.

The plating baths should run six months, at least, without any attention or addition of salts, except the addition of water to replace that lost by evaporation and the addition of a small amount of ferrous carbonate and charcoal once a week. The cost of the current used in cleaning and plating is small. The anodes are gradually used up and have to be replaced by new ones; however, the initial cost of an anode is distributed over a number of repair jobs, making the amount added to an individual piece small. The workman is concerned chiefly in getting pieces ready to be plated and cleaning the ones that have already been plated. As the pieces require no attention while in the plating bath, one man can handle enough pieces in a day to make such a shop a paying investment.

Meeting of American Gear Manufacturers

As MACHINERY goes to press, the American Gear Manufacturers' Association starts its semi-annual meeting at the Hotel Clifton, Niagara Falls, Canada. A varied program has been prepared for this meeting and several important papers will be read. One of these is by Professor V. O. Homerberg of the Massachusetts Institute of Technology, Cambridge, Mass., on the subject of "Nitro-Alloy Steels for Gears." This paper will be supplemented by another on the same subject, dealing more specifically with unusual gear problems, by Professor Earle Buckingham, also of the Massachusetts Institute of Technology.

As usual, a great deal of attention will be given to the standardization of gearing. A special standardization session will be held at which A. A. Ross of the General Electric Co., West Lynn, Mass., will preside. Mr. Ross was elected chairman of the General Standardization Committee last spring to succeed B. F. Waterman of the Brown & Sharpe Mfg. Co., Providence, R. I., who was elected president of the Association at its last annual meeting. At the standardization session, C. B. LePage, assistant secretary in charge of standardization work of the American Society of Mechanical Engineers, will speak on the subject "Looking Ahead in Gear Standardization and Research."

At two previous meetings, Emil Dukes, chief engineer of Gears and Forgings, Inc., Cleveland, Ohio, presented papers on the load and speed conditions of worm-gear drives, describing the results of tests conducted at the Case School of Applied Science in Cleveland. At the Niagara Falls meeting, Mr. Dukes will present a third installment of his paper, dealing with the results of tests recently undertaken.

One session will be devoted to the commercial side of the gear industry. At this session Albert Grover, cost accountant of the National Machine Tool Builders' Association, will deal with some of the commercial problems that arise in the machinery and allied industries, and present a solution to each problem. An opportunity will be provided for discussing Mr. Grover's solutions. The discussion will not take place at the end of the session, but each point will be discussed when it is brought up. A more complete report of the meeting and review of the papers presented will be published in November MACHINERY.

* * *

MEETING OF THE AMERICAN DROP FORGING INSTITUTE

The fall meeting of the American Drop Forging Institute will be held at Briarcliff Lodge, Briarcliff Manor, N. Y., October 9 to 11. A number of papers of timely interest in the machine building and metal-working industries will be presented, among which may be mentioned: "Fuel Oil and Furnaces," by R. C. Hopkins of the Volcanic Specialties Co.; "Stainless Steel," by Earl Smith of the Republic Steel Corporation; and "Experiences with Foremanship Training in the Metal Trades Industry," by A. R. Peirce, director, National Metal Trades Association.

The 1929 Census of Machine Tools

THE Bureau of Census announces that the total value of machine tools built in the United States in 1929, by plants engaged primarily in the manufacture of such products, amounted to $172,349,996, an increase of approximately 60 per cent as compared with 1927, the last preceding census year. Miscellaneous products built and repair work done in machine tool plants added $67,742,968 to the figure mentioned.

Under the definition of machine tools, as used by the Bureau of Census in arriving at its figures, the machine tool industry embraces plants engaged primarily in the manufacture of power-driven metal-cutting machines, but does not include certain types of metal-working machines such as sheet-metal working equipment (except power presses), welding machines, and wire-drawing and wire-working machines. The statistics cover 272 plants employing on an average 46,924 people, not including salaried employes. The industry paid in wages over $75,000,000, and used materials, fuel, and electric current to a value of $63,650,000.

Kind of Machines	Number	Value
Bending machines	2,497	$1,482,087
Boring machines:		
Horizontal	159	932,237
Vertical	257	1,363,881
Combined boring, drilling, and milling machines, and combined boring and turning mills	222	2,297,245
Other	96	983,606
Broaching machines	259	396,726
Cutting-off machines:		
Band saw	324	194,098
Cold saw	161	297,908
Hacksaw	2,680	642,475
Drilling machines:		
Bench	1,277	183,973
Honing machines	...	681,603
Horizontal	188	526,205
Vertical		
Multiple-spindle	913	3,699,275
Multiple-spindle, number not reported	.....	649,816
Sensitive		
Single-spindle	1,825	1,069,486
Single-spindle, number not reported	.....	668,234
Multiple-spindle	1,834	2,011,444
Standard	2,183	1,588,367
Radial		
Plain and Universal	1,280	4,579,683
Other	.....	1,507,493
Forging machines:		
Bolt, nut, and rivet	832	2,194,927
Bulldozers and other	.....	703,819
Gear-cutting machines:		
Formed rotary-cutter type		
Spur	73	283,967
Bevel	56	223,619
Hobbing, generator and other	1,628	6,118,010
Grinding machines:		
Cutter, drill, knife	2,162	1,573,766
Emery-wheel	11,999	364,552
External cylindrical		
Plain	1,358	6,200,946
Universal	583	1,137,378
Internal cylindrical	920	4,323,439
Surface	1,784	3,554,368
Other	.....	6,080,443
Hammers (not portable)	.....	1,483,915
Keyseaters	.....	94,999
Lathes:		
Automatic		
Bar	3,339	12,353,441
Chucking	1,398	6,002,597
Bench	1,026	337,739
Engine		
16 inches swing and under	6,265	5,321,765
Over 16 inches swing including 22 inches	1,525	3,177,746
Over 22 inches swing including 36 inches	674	2,356,963
Over 36 inches swing	41	482,798
Gap and all other	.....	3,123,355
Polishing, buffing, grinding	1,479	675,857
Turret		
Hand screw machines	1,004	2,717,865
Horizontal, vertical, and other automatic	.....	11,909,450
Milling machines:		
Hand-feed	312	129,803
Power-feed		
Plain	1,090	2,690,851
Universal	2,270	5,840,142
Vertical	453	1,341,362
Lincoln type	826	2,546,504
Planer type and other	605	3,528,481
Pipe-cutting and threading machines	976	1,180,190
Planers:		
Standard		
36 inches and under	61	359,627
Over 36 inches	57	807,835
Open-side	86	839,395
Special	45	263,251
Portable tools:		
Drills		
Electric	85,521	3,226,470
Pneumatic	13,712	1,744,503
Grinders		
Electric	31,862	1,463,569
Pneumatic	10,072	1,065,625
Hammers (chipping, riveting, calking, etc.)		
Electric	3,225	484,075
Pneumatic	29,224	1,694,961
Woodworking		
Electric hand saws and others	.....	923,226
All other, including flexible shaft tools	.....	3,721,529
Presses:		
Forming and hydraulic	609	1,756,371
Stamping		
Foot	273	52,195
Power	4,343	6,608,334
Punch	1,634	1,001,324
Arbor, hand, and other	2,317	238,151
Punching machines (not portable)	320	1,038,331
Riveting machines	779	178,426
Shapers:		
Horizontal		
20 inches stroke and under	1,026	1,415,539
Over 20 inches stroke, including 28 inches	431	837,774
Over 28 inches stroke	191	506,994
Shears (hand)	797	22,696
Shears (power)		
Combination punch and shear	227	347,734
Rotary	550	193,591
Straight	746	961,892
Alligator and other	281	421,900
Slotters	124	184,921
Threading machines (except for pipe)		
Die type	636	1,255,286
Milling type	150	680,432
Tapping machines	402	544,380
All other machine tools	.....	10,698,760

HELIX ANGLES FOR METRIC SCREW THREADS—1

Diameter, Millimeters	Pitch of Thread, Millimeters										
	0.6	0.75	0.9	1	1.25	1.5	1.75	2	2.5	3	3.5
	Helix Angles (Degrees and Minutes) Based on the Pitch Diameters										
4	3°–2′	3°–53′	4°–48′	5°–26′	7°–7′	8°–58′	11°–1′	......	......	......	......
4.5	2°–40′	3°–24′	4°–11′	4°–44′	6°–9′	7°–43′	9°–24′	......	......	......	......
5	2°–22′	3°–2′	3°–43′	4°–11′	5°–26′	6°–46′	8°–12′	......	......	......	......
5.5	2°–8′	2°–44′	3°–20′	3°–45′	4°–51′	6°–1′	7°–17′	......	......	......	......
6	1°–57′	2°–29′	3°–2′	3°–24′	4°–23′	5°–26′	6°–32′	7°–43′	......	......	......
7	1°–39′	2°–6′	2°–33′	2°–52′	3°–41′	4°–32′	5°–26′	6°–22′	8°–25′	......	......
8	1°–26′	1°–49′	2°–13′	2°–29′	3°–10′	3°–53′	4°–38′	5°–26′	7°–7′	......	......
9	1°–16′	1°–36′	1°–57′	2°–11′	2°–47′	3°–24′	4°–3′	4°–43′	6°–9′	7°–42′	......
10	1°–8′	1°–26′	1°–45′	1°–57′	2°–29′	3°–2′	3°–36′	4°–11′	5°–26′	6°–46′	8°–12′
11	1°–2′	1°–18′	1°–35′	1°–46′	2°–14′	2°–44′	3°–14′	3°–45′	4°–51′	6°–1′	7°–16′
12	0°–57′	1°–11′	1°–26′	1°–36′	2°–2′	2°–29′	2°–56′	3°–24′	4°–23′	5°–26′	6°–35′
14	0°–48′	1°–1′	1°–13′	1°–22′	1°–44′	2°–6′	2°–29′	2°–52′	3°–41′	4°–32′	5°–26′
16	0°–42′	0°–53′	1°–4′	1°–11′	1°–30′	1°–49′	2°–9′	2°–29′	3°–10′	3°–53′	4°–38′
18	0°–37′	0°–47′	0°–57′	1°–3′	1°–20′	1°–36′	1°–54′	2°–11′	2°–47′	3°–24′	4°–3′
20	0°–33′	0°–42′	0°–51′	0°–57′	1°–11′	1°–26′	1°–42′	1°–57′	2°–29′	3°–2′	3°–36′
22	0°–29′	0°–38′	0°–46′	0°–51′	1°–5′	1°–18′	1°–32′	1°–46′	2°–14′	2°–44′	3°–14′
24	0°–28′	0°–35′	0°–42′	0°–47′	0°–59′	1°–11′	1°–24′	1°–36′	2°–2′	2°–29′	2°–56′
27	0°–25′	0°–31′	0°–37′	0°–42′	0°–52′	1°–3′	1°–14′	1°–25′	1°–48′	2°–11′	2°–35′
30	0°–22′	0°–28′	0°–34′	0°–37′	0°–47′	0°–57′	1°–6′	1°–16′	1°–36′	1°–57′	2°–18′
33	0°–20′	0°–25′	0°–30′	0°–34′	0°–42′	0°–51′	1°–00′	1°–9′	1°–27′	1°–46′	2°–5′
36	0°–18′	0°–23′	0°–28′	0°–31′	0°–39′	0°–47′	0°–55′	1°–3′	1°–20′	1°–36′	1°–54′
39	0°–17′	0°–21′	0°–26′	0°–29′	0°–36′	0°–43′	0°–51′	0°–58′	1°–13′	1°–29′	1°–44′
42	0°–16′	0°–20′	0°–24′	0°–26′	0°–33′	0°–40′	0°–47′	0°–54′	1°–8′	1°–22′	1°–36′
45	0°–15′	0°–18′	0°–22′	0°–25′	0°–31′	0°–37′	0°–44′	0°–50′	1°–3′	1°–16′	1°–30′
48	0°–14′	0°–17′	0°–21′	0°–23′	0°–29′	0°–35′	0°–41′	0°–47′	0°–59′	1°–11′	1°–22′
52	0°–13′	0°–16′	0°–19′	0°–21′	0°–27′	0°–32′	0°–38′	0°–43′	0°–54′	1°–6′	1°–17′
56	......	0°–15′	0°–18′	0°–20′	0°–25′	0°–30′	0°–35′	0°–40′	0°–50′	1°–1′	1°–11′
60	......	......	0°–17′	0°–19′	0°–23′	0°–28′	0°–33′	0°–37′	0°–47′	0°–57′	1°–6′
64	......	......	0°–16′	0°–17′	0°–22′	0°–26′	0°–30′	0°–35′	0°–44′	0°–53′	1°–2′

MACHINERY'S Data Sheet No. 187, New Series, October, 1930 Contributed by F. A. Firnhaber

HELIX ANGLES FOR METRIC SCREW THREADS—2

Diameter, Millimeters	Pitch of Thread, Millimeters										
	4	4.5	5	5.5	6	6.5	7	7.5	8	10	12
	Helix Angles (Degrees and Minutes) Based on the Pitch Diameters										
11	8°–37′	......	......	......	......	......	......	......	......	......	......
12	7°–43′	8°–9′	......	......	......	......	......	......	......	......	......
14	6°–22′	6°–48′	8°–25′	......	......	......	......	......	......	......	......
16	5°–26′	5°–51′	7°–7′	8°–1′	......	......	......	......	......	......	......
18	4°–44′	5°–7′	6°–9′	6°–55′	7°–43′	......	......	......	......	......	......
20	4°–11′	4°–33′	5°–26′	6°–7′	6°–46′	7°–28′	......	......	......	......	......
22	3°–45′	4°–18′	4°–51′	5°–26′	6°–3′	6°–41′	......	......	......	......	......
24	3°–24′	3°–53′	4°–23′	4°–54′	5°–26′	6°–1′	6°–34′	......	......	......	......
27	2°–59′	3°–24′	3°–50′	4°–16′	4°–43′	5°–11′	5°–40′	6°–9′	......	......	......
30	2°–40′	3°–2′	3°–24′	3°–47′	4°–11′	4°–35′	5°–00′	5°–26′	5°–52′	......	......
33	2°–24′	2°–44′	3°–4′	3°–24′	3°–45′	4°–7′	4°–29′	4°–51′	5°–14′	6°–51′	......
36	2°–11′	2°–29′	2°–47′	3°–5′	3°–24′	3°–44′	4°–3′	4°–23′	4°–43′	6°–9′	7°–43′
39	2°–00′	2°–16′	2°–33′	2°–50′	3°–7′	3°–24′	3°–42′	4°–00′	4°–19′	5°–36′	7°–2′
42	1°–51′	2°–6′	2°–21′	2°–36′	2°–52′	3°–8′	3°–24′	3°–41′	3°–58′	5°–7′	6°–23′
45	1°–43′	1°–57′	2°–11′	2°–25′	2°–40′	2°–54′	3°–9′	3°–24′	3°–40′	4°–44′	5°–52′
48	1°–36′	1°–49′	2°–2′	2°–15′	2°–29′	2°–42′	2°–56′	3°–10′	3°–24′	4°–23′	5°–26′
52	1°–29′	1°–40′	1°–52′	2°–4′	2°–17′	2°–29′	2°–41′	2°–54′	3°–7′	4°–00′	5°–3′
56	1°–22′	1°–33′	1°–44′	1°–55′	2°–6′	2°–17′	2°–29′	2°–40′	2°–52′	3°–41′	4°–32′
60	1°–16′	1°–26′	1°–36′	1°–47′	1°–57′	2°–7′	2°–18′	2°–29′	2°–40′	3°–24′	4°–11′
64	1°–11′	1°–21′	1°–30′	1°–40′	1°–49′	1°–59′	2°–9′	2°–19′	2°–29′	3°–10′	3°–53′
68	1°–7′	1°–16′	1°–24′	1°–33′	1°–42′	1°–51′	2°–1′	2°–10′	2°–19′	2°–58′	3°–38′
72	1°–3′	1°–11′	1°–20′	1°–28′	1°–36′	1°–45′	1°–54′	2°–2′	2°–11′	2°–47′	3°–24′
76	1°–00′	1°–6′	1°–15′	1°–23′	1°–31′	1°–39′	1°–47′	1°–55′	2°–4′	2°–37′	3°–12′
80	0°–57′	1°–4′	1°–11′	1°–19′	1°–26′	1°–34′	1°–41′	1°–49′	1°–57′	2°–29′	3°–2′
84	0°–54′	1°–1′	1°–8′	1°–15′	1°–22′	1°–29′	1°–36′	1°–44′	1°–51′	2°–21′	2°–52′
88	0°–51′	0°–58′	1°–5′	1°–11′	1°–18′	1°–25′	1°–32′	1°–39′	1°–46′	2°–14′	2°–44′
92	0°–49′	0°–55′	1°–2′	1°–8′	1°–14′	1°–21′	1°–28′	1°–34′	1°–41′	2°–8′	2°–36′
96	0°–47′	0°–53′	0°–59′	1°–5′	1°–11′	1°–17′	1°–24′	1°–30′	1°–36′	2°–2′	2°–29′
100	0°–45′	0°–51′	0°–57′	1°–3′	1°–8′	1°–14′	1°–20′	1°–26′	1°–32′	1°–57′	2°–22′

MACHINERY'S Data Sheet No. 188, New Series, October, 1930 Contributed by F. A. Firnhaber

New Shop Equipment

Recent Advances in the Design of Metal Working Machines

Small Tools and Work-handling Appliances

MARQUETTE "4-KRANK" PRESS

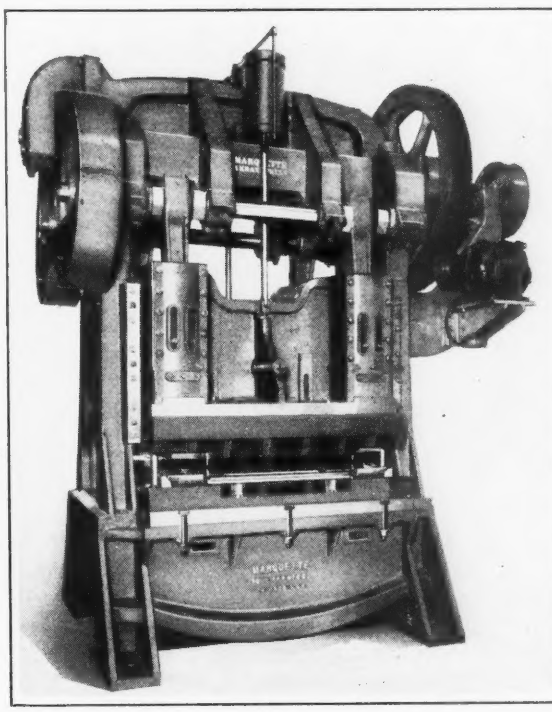
In heavy drawing and similar operations on power presses, trouble is sometimes experienced by lost motion in parts of the machine mechanism causing so much play between the die members as to spoil the work or break the die. Such a condition is especially likely to occur when the work is large and an exceptionally high pressure is required to shape the metal.

With a view to overcoming such difficulties, the Marquette Tool & Mfg. Co., 6495 W. 65th St., Chicago, Ill., has developed the "four-point suspension press" here illustrated. In this machine, two crankshafts and four pitmans are used for reciprocating the slide. The pitmans are so arranged that one pair balances the pressure developed by the opposite pair. As a result, the slide and upper die member are given a true vertical movement down on the lower die member without any sidewise motion.

In blanking or piercing operations, it is imperative for the slide to register accurately with the bed, and in order to make sure that it will, dies are commonly provided with hardened and ground leader pins. In the "4-Krank" press, accurate registration is insured by the slide being suspended at its four corners by the four pitmans.

In order to accommodate large dies, the bed is made wide and deep. It is intended that the dies be placed as close as possible to the front edge of the bed and they may even overhang the bed both front and back. On irregular shapes, if the dies are placed off center, there is a tendency for the slide to be tilted out of its parallel position, particularly if it is loose in the guides. With the four-point suspension slide, any possibility of such tilting is eliminated.

The press is driven by an electric motor through gearing to the main driving shaft which extends through the top of the machine. The two crankshafts are rotated in opposite directions. Vertical adjustments of the slide are made by means of screws for the pitmans, all of the screws being connected through gearing so that the four adjustments can be made simultaneously, either



Marquette Power Press with Two Crankshafts and Four Pitmans

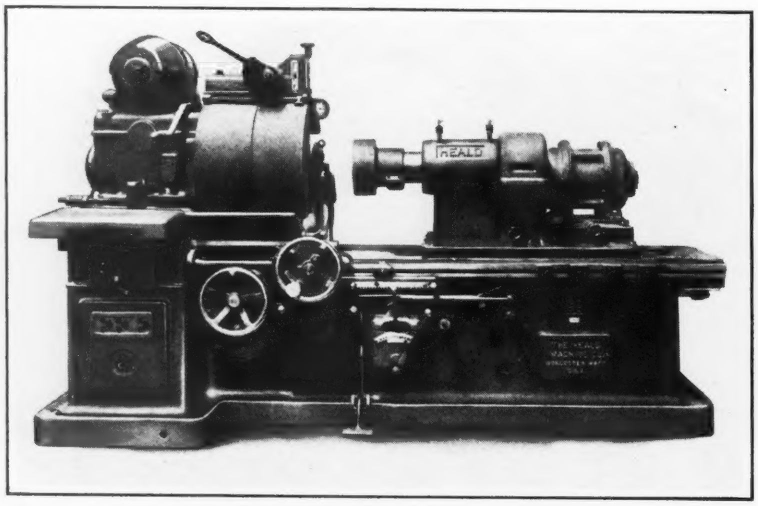


Fig. 1. Heald Heavy-duty Internal Grinding Machine which Weighs Approximately Nine Tons

by a hand-lever or by an electric motor.

The press can be furnished with either a plain bed or a bed machined to receive the Marquette die cushion equipment. When the latter type of bed is provided, the casting may either be machined to constitute the cylinder in which the equipment is mounted or the casting may be otherwise designed for mounting the die cushions in place. The press is built in various sizes having crankshafts from 4 1/2 inches in diameter upward. It can be built in any height, width, and pressure capacity.

HEALD INTERNAL GRINDING MACHINE FOR LARGE WORK

A chucking internal grinding machine that is about twice as large as any machine previously built by the Heald Machine Co., Worcester, Mass., has recently been developed by that concern. This No. 77 machine provides means of rapidly "hogging" out metal from large gears, bearing races, rolls, pipes, etc., and then finishing the work within close limits. It will grind straight or taper bores with equal facility and face-grind without a change of set-up. Using a 12-inch wheel, bores up to 21 inches in diameter can be ground. The smallest bore that can be ground is 3 inches in diameter, and the greatest length of bore, 15 inches. Work up to 35 inches in diameter can be swung over the table, and up to 21 inches in diameter inside the standard water guard. The machine occupies a floor space of 10 feet 3 inches by 6 feet 6 inches, and weighs about 18,000 pounds, or 9 tons.

Three motors are provided for driving this machine, a 25-horsepower motor for the wheel-head, a 3-horsepower adjustable-speed motor for rotating the work, and a 3-horsepower motor for driving the pump of the hydraulic system. Anti-friction bearings are provided throughout, and lubricant is supplied under pressure to all sliding ways.

Hydraulic operation of the table provides a steady, instantly controlled drive at innumerable speeds from 0 to 25 feet per minute. Although the table, together with the wheel-head and its driving motor, has a weight of 3300 pounds, it can readily be reversed at the maximum speed without vibration.

Convenience of operation through centralized control is another feature of the machine. The operator can govern the starting and braking of the work-head, the feeding and reversing of the table, the cross-feed, the dial indicator, the truing diamond, and the motor control panel without moving from his position at the center of the machine. Automatic reversal of the table is controlled by three adjustable dogs, two of which provide any length of movement up to a maximum of 36 inches. The third dog allows the table to withdraw sufficiently so that the wheel can pass the diamond during the truing operation. Hand reversal of the table can be accomplished at any point and the table can also be fed longitudinally by hand.

The work-head can be swiveled 22 1/2 degrees on a large stud by means of a precision device. The hardened and ground work-head spindle is mounted in two large anti-friction bearings which are readily adjusted from the front. Work-head spindle speeds varying from 35 to 140 revolutions per minute are available.

A dial indicator that shows changes in work size by means of direct readings can be provided, as illustrated in Fig. 2. This indicator not only tells the operator when the hole is finished, but also enables him to true the wheel at any predetermined point before the finished size is reached. This is a vital factor in holding to close limits or in obtaining a fine finish.

The sizing control unit has a diamond-pointed finger which is brought in contact with the hole of the work during grinding, but which can be swung out of the way for removing finished work and chucking a new piece. The position of the sizing unit can be adjusted to suit various diameters and lengths of holes.

Fig. 3 shows a swinging wheel-truing device which is operated hydraulically and is easily positioned. The diamond is held rigidly when truing the wheel, trues at the same point at which the wheel grinds, and is presented to the wheel at 90 degrees to its axis and parallel to the main table ways, thus assuring square truing. The diamond is swung into the truing position and back to the rest position by a hand-lever at the front of the machine

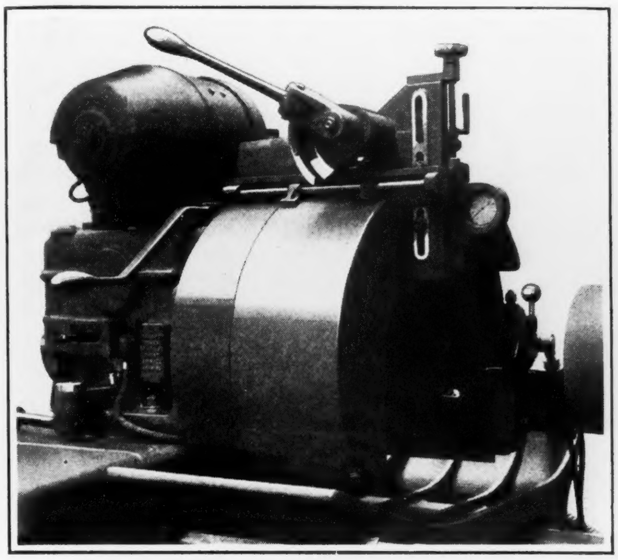


Fig. 2. View of Work-head Showing Dial that Indicates Changes in the Size of the Work

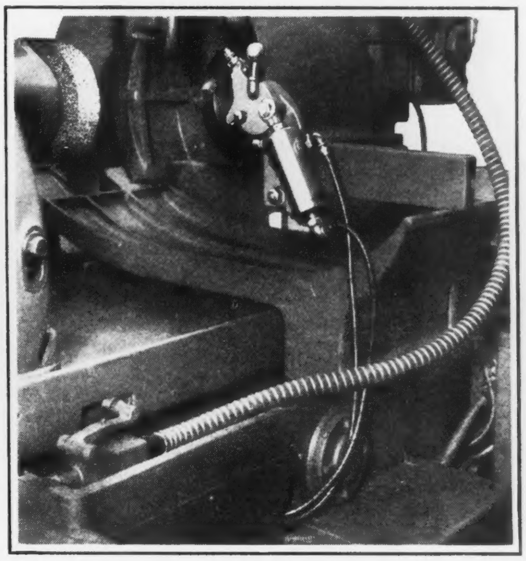


Fig. 3. Swinging Wheel-truing Device which is Hydraulically Operated

which controls a valve that governs the flow of oil to the diamond cylinder. The diamond is returned to the rest position automatically if the operator fails to return it manually.

The feeding principle of this machine is entirely different from that of other Heald internal grinding machines in that the work is fed to the wheel instead of the wheel to the work. This is accomplished by the work-head being mounted on a cross-slide carriage. Any feed from 0.00014 to 0.0011 inch per table stroke is obtainable. A coarse feed can be set for rough-grinding to a predetermined point, at which time the feed is automatically changed for finishing. When the work has reached the finished size, the fine feed is disengaged automatically.

MADISON-KIPP DIE-CASTING MACHINE

In February, 1928, MACHINERY (pages 460 to 463) was published a description of a die-casting machine that had been placed on the market by the Madison-Kipp Corporation, 203 Waubesa St., Madison, Wis., after it had been used a number of years for the production of die-castings employed in the products of this concern. Subsequent experience in making dies and in operating machines on work of other die-casting manufacturers has led to the production of die-castings of steadily increasing sizes, as for example, typewriter frames. To meet the requirements of such large work, the company has now brought out the machine here illustrated. This machine is not only of increased size, but also incorporates numerous modifications in the design to suit the handling of large work.

The melting pot of the new machine has a capacity two and one-half times that of the first machine, and in place of two gas burners at the end of the smaller melting pot, there are now five gas burners at each side. The waste heat from these burners passes up through two hollow castings having outlets located close to each side of the gooseneck which delivers the metal from the pot to the die. This residual heat prevents the metal from solidifying in the top of the gooseneck. A liberal supply of molten metal is also insured through the provision of a layer of "Sil-O-Cell" around the refractory lining of the pot, the total thickness of the insulation being 6 inches. This adequate insulation and the method of heating the pot are especially valuable in casting aluminum mixtures.

Larger dies can be accommodated on the new machine because the center distances between the four guide rods that carry the die carriage are 16 inches between the horizontal rods and 12 inches between the vertical rods. In addition, the stroke of the carriage on which the movable die member is mounted has been increased 2 5/8 inches, bringing it up to the full 12-inch stroke.

The movable die member is now bolted to a steel bolster plate attached to the carriage. The bolster plate has sixteen holes for this purpose, and may be drilled to suit special die forms. After a large number of special holes has been drilled, it is an easy matter to substitute a new bolster plate. Stationary dies can be mounted on the hot plate of the machine, measuring 4 1/2 inches out from this plate to the parting line, without any offset. Additional space can be obtained by inclining the parting line of the die and having the gate run up to the cavity on an incline from the hot plate.

With the view of providing the necessary rigidity to guard against damaged dies and imperfect work, all parts of the machine have been increased in size and additional tie members have been provided. The new machine weighs 12,000 pounds, as compared with 7400 pounds for the smaller machine. The movable die carriage is backed up by a heavy cast-steel cross-head in which are bearings that have both inside and outboard supports.

All important bearings in the machine are lubricated through individual oil-tubes connected to a Madison-Kipp lubricator. When multiple-cavity dies are operated at high speed on long runs, automatic lubrication of the dies may also be obtained direct from a lubricator of this type. For average work, the dies may be lubricated simultaneously with the blowing off of the chips by a compressed air nozzle, by first dipping the end of the nozzle into oil.

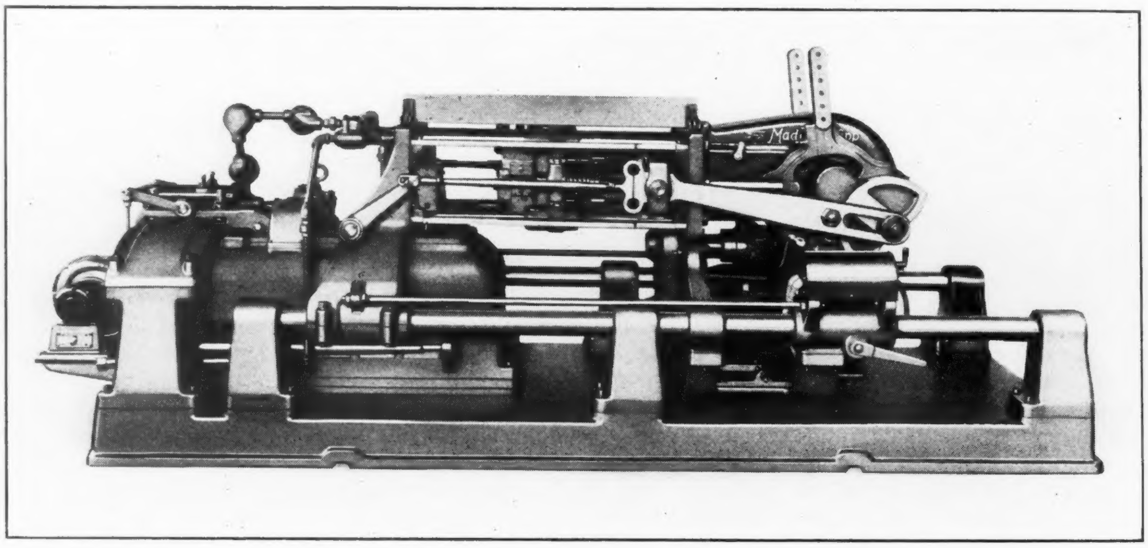
A number of improvements have been incorporated in the automatic control mechanism. Among these is the means by which the cores are advanced to and withdrawn from the stationary die. Back of the cam and crank mechanism which actuates connecting-rods from the main driving shaft to the carriage there is a second pair of cams which imparts an oscillatory movement to two vertical levers extending up from the gear-box. A series of bearing holes is drilled in each of these levers. The cams that oscillate the levers are so arranged that at the right point in the machine cycle, the levers extend forward to a position above the hot plate that will give the required movement to oscillating bellcranks or some similar mechanism. The bell-cranks may be used for advancing or withdrawing the cores.

Another improvement lies in the provision of flexible connections in the pipes that run to the control valve on the machine from the supply of compressed air and from the valve to the air chamber back of the gooseneck that applies pressure to force successive "shots" of metal into the die. These flexible connections enable adjustments to be made without loosening and replacing a sliding connection.

Attention is also called to a safety device which makes it impossible for air pressure to force metal into the die should the operator accidentally start the machine in the reverse direction.

Adjustment of the machine along the main base rails to bring the die gate in the desired location over the gooseneck nozzle is facilitated by the provision of rack teeth on the under side of the main base rails with which pinions turned by means of hand-levers mesh. Another feature of the equipment is an automatic locking device that holds the die tightly closed at the time that the hot metal is introduced. This prevents accidents from metal spurting out between the die members.

The machine is fully automatic, being controlled through a single lever which operates a clutch. Power is furnished by a three-horsepower, four-speed electric motor. With the four speeds, 2.77, 4.16, 5.55, and 8.33 "shots" can be made per minute.



Madison-Kipp Die-casting Machine of Increased Capacity

MURCHEY PRECISION THREADING MACHINE

A threading machine intended for cutting accurate threads on a production basis is the latest development of the Murchey Machine & Tool Co., 951 Porter St., Detroit, Mich. This machine, as here illustrated, is designed to use Murchey self-opening Type CO die-heads or Murchey collapsible taps. An important feature of the machine is that the threading operations are con-

trolled by a hardened lead-screw ground to a tolerance of 0.0001 inch per inch of lead. Threads from 1/2 to 1 1/4 inches in diameter and up to 3 inches long can be cut.

Two motors are used for supplying power, a three-horsepower motor driving the machine and a 1/4-horsepower motor driving the pumps and the return worm-shaft. Both motors run at a speed of 1800 revolutions per minute. The motors are provided with magnetic reversing switches, making it possible to operate the machine either right- or left-hand. Combination right- and left-hand drives are furnished for the spindle and die-head, thus making it possible to produce threads of either hand by simply changing the chasers, the lead-screw, and the lead-nuts. The machine is lubricated by a combination force feed and flood system. Cutting compound is delivered under pressure through the spindle.

Assuming that the machine is idle with the chasers closed and the lead-nuts disengaged, the operation sequence is as follows: First, the machine is started by pressing the switch button located on the left-hand side; then by pressing a lever handle, the segmental lead-nuts are made to engage the lead-screw and thus produce the forward motion of the spindle for cutting the thread; finally, when the desired length of thread has been cut, the chasers and lead-nuts open automatically and the spindle is returned to its starting position. Adjustable stops determine the length of the thread being cut.

The segmental lead-nuts open and close similar to the chasers in a self-opening die-head. If desirable, these lead-nuts may be removed for operating the machine manually. The engagement of the nuts with the lead-screw is cushioned by a spring.

When different thread diameters to be cut necessitate a change in the spindle speed, the change may be made by using different combinations of the pick-off gears seen in Fig. 2. It is mentioned that, owing to the accessibility of the machine, the lead-screw, segmental lead-nuts, chasers, and pick-off gears can all be changed in not over thirty minutes.

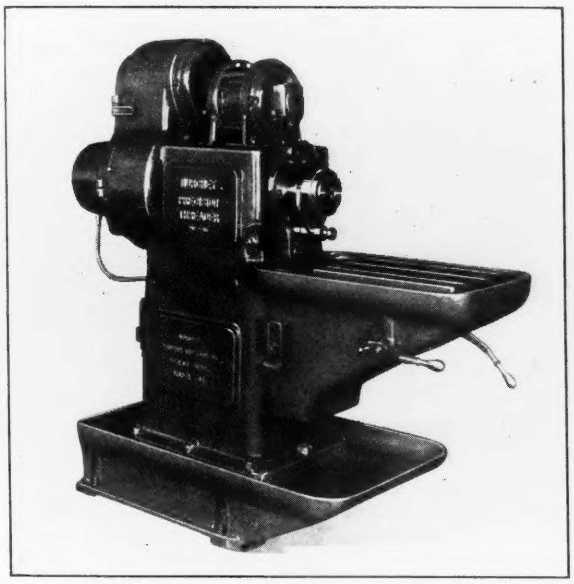


Fig. 1. Murchey Precision Threader in which the Operation is Controlled by Lead-screw Threads

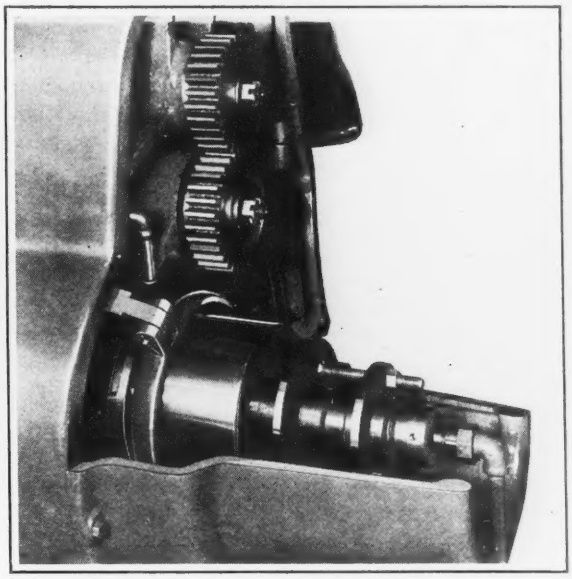


Fig. 2. View Showing the Lead-screw and Pick-off Gears for Speed Changes

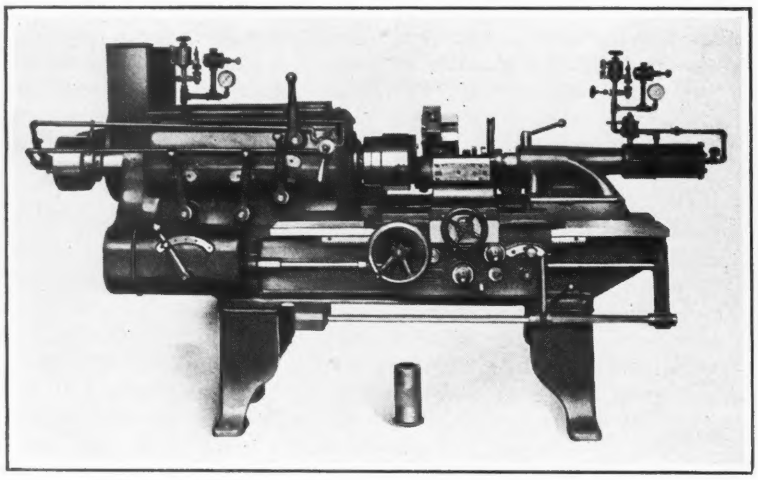
GASOLINE METAL-CUTTING TORCH

Gasoline is used as fuel in a new type of metal-cutting torch recently developed by the Torchweld Equipment Co., 224 N. Carpenter St., Chicago, Ill. One of the advantages claimed is that two gallons of gasoline will do as much work as a large heavy cylinder full of another fuel gas. It is also pointed out that gasoline can be obtained conveniently and at a low cost.

The outfit includes a cutting torch with four interchangeable tips, a two-gallon gasoline tank, a high-pressure two-gage oxygen regulator, hose, etc.

MONARCH LATHE WITH AIR-OPERATED CHUCK AND TAILSTOCK SPINDLE

The Monarch Machine Tool Co., Sidney, Ohio, has recently built a special 20-inch by 6-foot lathe equipped with a "Logan" three-jaw air chuck and an air cylinder for operating the tailstock spindle. This machine is provided with an eight-speed helical-geared headstock equipped with Timken tapered roller bearings, and is arranged for either a single-pulley or a direct motor drive. The tailstock center also has an anti-friction bearing.



Monarch Lathe Especially Equipped for Machining Cylinder Sleeves

A back-arm facing attachment provides for facing cylinder sleeves of the type shown beneath the lathe. In machining these sleeves, three tungsten-carbide turning tools are mounted on the front tool-rest, a tool of the same kind being employed on the facing attachment. These cylinder sleeves measure 4 3/8 inches outside diameter by 9 1/2 inches in length. They are machined at the rate of 300 surface feet per minute, being revolved at a speed of 240 revolutions per minute. The feed per spindle revolution is 0.040 inch. The time required to turn each sleeve with this equipment is 15 seconds, as against 2 1/2 minutes with the method that was formerly employed.

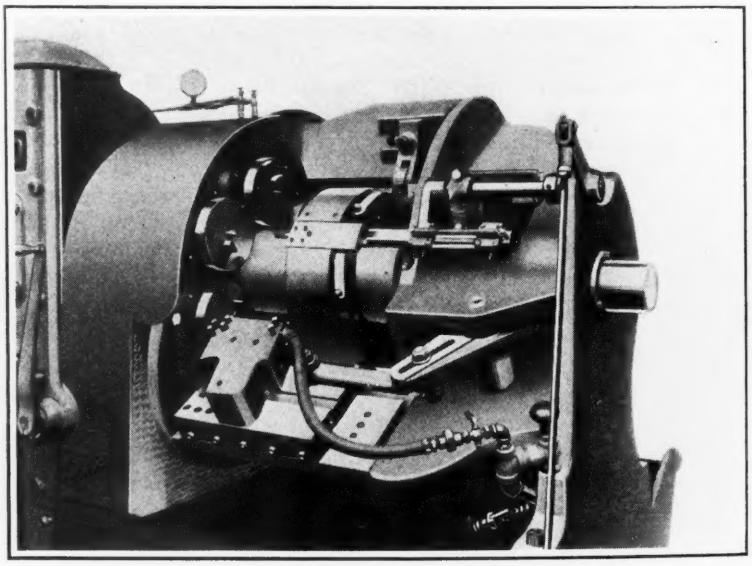
BAIRD HORIZONTAL SIX-SPINDLE LATHE

A six-spindle lathe designed for handling work best turned on centers is a recent development of the Baird Machine Co., Bridgeport, Conn. As will be seen from the illustration, the center bar of the machine carries a turret equipped with tail-centers. This bar and the turret index with the spindle turret. The tail-center turret is adjustable longitudinally to suit the length of the work. With the exception of the working end, this machine is similar to the Baird horizontal six-spindle chucking machine.

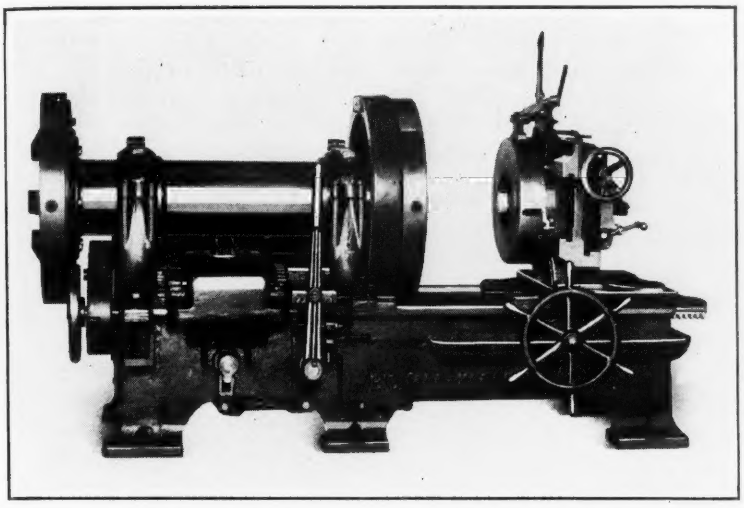
An important feature of the new machine which increases the accuracy of the work produced is an automatic take-up for looseness or slack on the centers which develops in doing work of the nature mentioned. At each station, the slides that carry the centers are unlocked, the looseness is taken up, and the slides are again locked, all automatically. A detail that facilitates reloading is that the tail-centers are withdrawn by the operator placing his foot on the treadle, thus leaving both hands free for handling the work. When the machine is arranged for "double indexing," two pieces of work are unloaded and loaded as the turrets index two stations. Another important feature is an automatic safety control and machine stop, which is particularly advantageous when the operator has charge of more than one machine.

The machine is regularly provided with four longitudinal slides which are carried on the headstock and tailstock and receive their motion from the cam-drum in the headstock. Through adjustable link connections, each slide can be given the same or a different stroke. When the machine is set up for single indexing, five work stations are available for each piece, four stations being provided with the regular longitudinal tool-slides and the fifth station with some other tool arrangement, such as a cross-slide or a cross-drilling attachment.

If required, chucks or other holding fixtures can be used on the spindles in place of and, in some cases, in addition to the centers. The net weight of this machine is approximately 12,000 pounds. The equipment shown in the illustration has a capacity for handling work up to 7 inches in diameter and 8 inches in length.



Baird Six-spindle Lathe Arranged for Handling Work Preferably Turned on Centers



Bignall & Keeler Duplex Machine for Threading and Cutting Pipe

BIGNALL & KEELER PIPE THREADING AND CUTTING MACHINE

A No. 8 duplex machine designed for cutting and threading pipe and casing from 2 1/2 to 8 1/4 inches has been added to the line of equipment manufactured by the Bignall & Keeler Machine Works of the N. O. Nelson Mfg. Co., Edwardsville, Ill. This machine is provided regularly with a Peerless sliding die-head having expanding dies. A screw adjustment facilitates setting the dies accurately to the proper size. There is a positive locking arrangement which takes all strain from the adjusting screw and insures duplicate threads.

Eight speed changes are obtainable through the gear-box, the lower half of which is part of the bed casting. A two-way positive clutch with fast and slow positions provides for stopping and starting the machine quickly. It also enables the operator to shift quickly to higher speeds for the cutting-off operation on large pipe.

A three-jaw independent chuck is mounted on both ends of the arbor. Each jaw has a tool-steel gripper which can be readily removed for sharpening. The rear chuck is equipped with special flange grippers for use in making flanged fittings. Self-centering V-jaws steady the pipe while cutting off, reaming, and beveling.

The die-head can be slid to one side for changing dies and to facilitate feeding the cutting-off tool to collars. The head can be arranged for dies of extra width, either 3 7/16 or 4 7/16 inches. Landis, as well as Peerless, die-heads and dies can be employed if desired. This machine weighs about 7500 pounds and is operated by a five-horsepower motor.

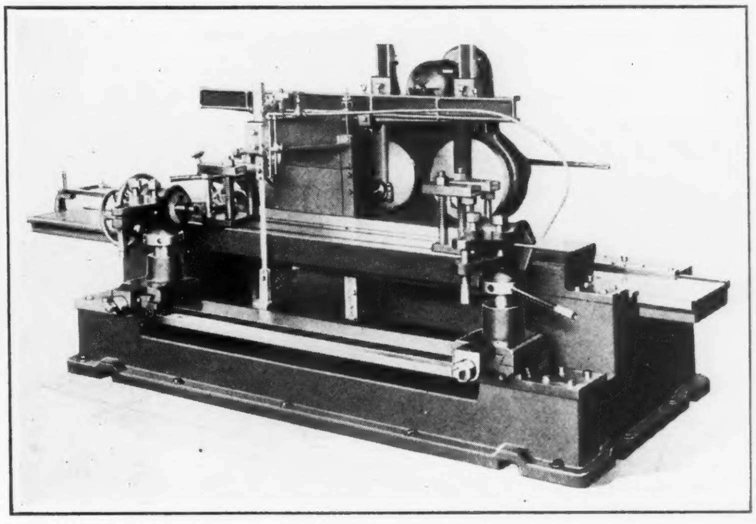
DEVICE FOR OBTAINING HYDROGEN FOR WELDING

The General Electric Co. of Schenectady, N. Y., has developed equipment for the dissociation of anhydrous ammonia into its component parts of 25 per cent nitrogen and 75 per cent hydrogen. With this equipment, hydrogen for atomic hydrogen welding can be obtained very economically. The equipment has a capacity for supplying enough hydrogen per hour to operate a 1/8-inch electrode-holder for current values up to and including 70 amperes. The pressure of the gas at delivery does not exceed 10 pounds per square inch. The electrical rating of the equipment is 3.5 kilowatts at 220 volts, 60 cycles, alternating current.

PEERLESS METAL SAWING MACHINE

The Firth-Sterling Steel Co., McKeesport, Pa., casts three-wing billets of a clover leaf design. The wings of these billets are of various dimensions up to 10 by 10 inches, and the billets themselves are 4 feet long. For cutting off the three wings from these billets, use is made of the machine here illustrated. It was especially built for the operation by the Peerless Machine Co., 1218 Sixteenth St., Racine, Wis.

In operation, the billet is laid lengthwise in the two vises at the front of the long table in



Peerless Metal Sawing Machine Designed for Cutting Long Billets

such a manner that one wing rests on the table. This wing is then clamped additionally by means of the two fixtures on which coil springs may be seen. The saw blade is carried along the billet for a distance of more than 4 feet, and at the same time is reciprocated up and down. Upon the completion of the cut, a 10- by 10-inch wing, 4 feet in length, is freed from the remainder of the billet and rests on the table. The billet is then turned over and the next wing cut off in the same way. The machine has a weight of approximately 8000 pounds.

AUTOMATIC DOUBLE-SPINDLE NUT-TAPPING MACHINE

Hexagonal and square nuts from 1/4 to 7/16 inch in size, and of U. S. or S. A. E. standard, can be tapped in a double-spindle automatic machine being introduced to the trade by the Automatic Nut-Thread Corporation, 3617-19 N. Eighth St., Philadelphia, Pa. This machine has been designated as "Threadnut No. 1," and is designed on the same principles as the previous machines built by the concern. Bent-shank taps are used, the taps remaining stationary and the nut blanks revolving. Fig. 2 shows the discharge end of the spindles with the housing cover thrown back. All important revolving parts of the machine are mounted in ball bearings.

A special feature of this equipment is that the nut blanks are fed to the tapping spindles from a single hopper of the rotary disk type. Two centrifugal pumps are provided, one for each spindle, to force coolant through a flexible steel hose to the spindles and directly on the taps. There is a safety device which permits one spindle to continue operating in the event that the other becomes clogged. Change-gear boxes permit the tapping speed or lead to be altered conveniently.

The standard machine is furnished with a single clutch pulley for a belt drive, but there is provision for the application of a motor drive. In the latter case, either a multiple V-belt, silent-chain, or flat-belt drive can be supplied. It is stated that in tapping 3/8-inch hexagonal nuts having 24 threads per inch, a production of 3120 nuts per hour is obtained.

SCHATZ AUTOMATIC HIGH-SPEED PRESSES

Automatic high-speed presses with a grip feed have been developed by the Schatz Mfg. Co., Poughkeepsie, N. Y., in various sizes having capacities of 35, 55, 90, 140, and 225 tons, respectively. Speeds up to 300 strokes per minute are obtainable on the smallest machine, and 75 strokes per minute on the largest.

The new grip feed comprises two sliding carriages connected by bars which are easily removed when changing tools. On each carriage there is a grip lifted by cams, and in each housing is located a fixing grip that holds the material in place while it is being punched. The fixing grips are released automatically before each advance of the strip. A scrap shear at the extreme right of the machine can be adjusted to cut the strip at its weakest

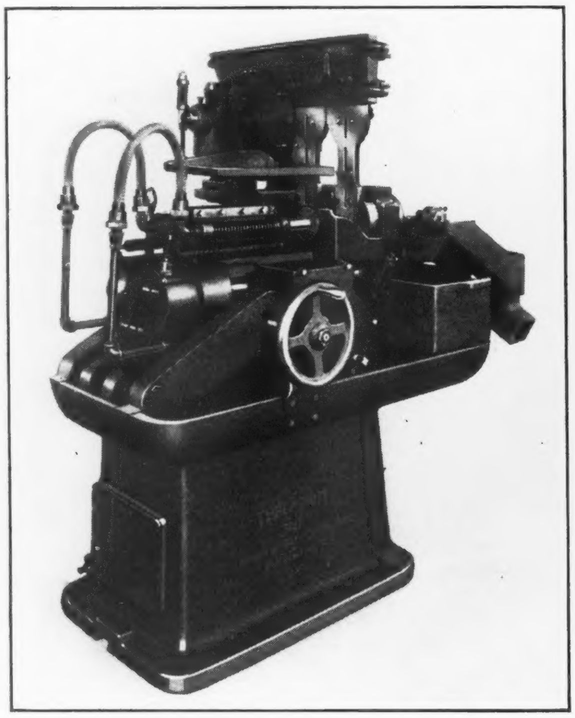


Fig. 1. "Threadnut" Automatic Nut-tapping Machine with Two Spindles

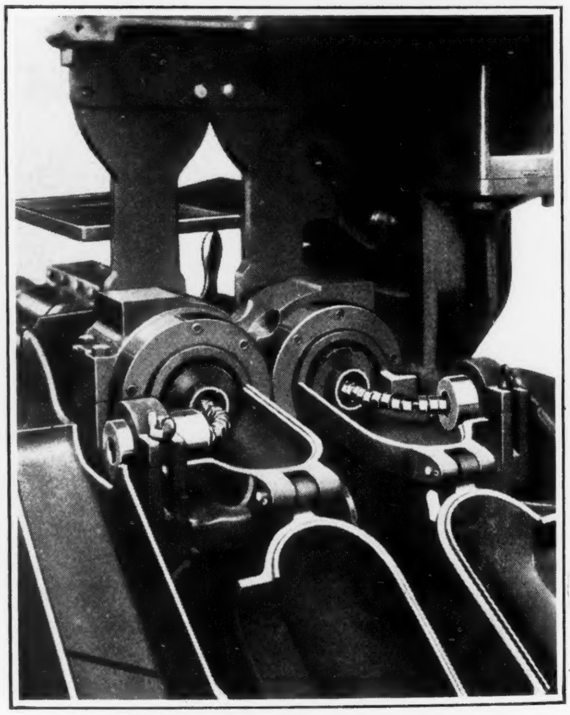
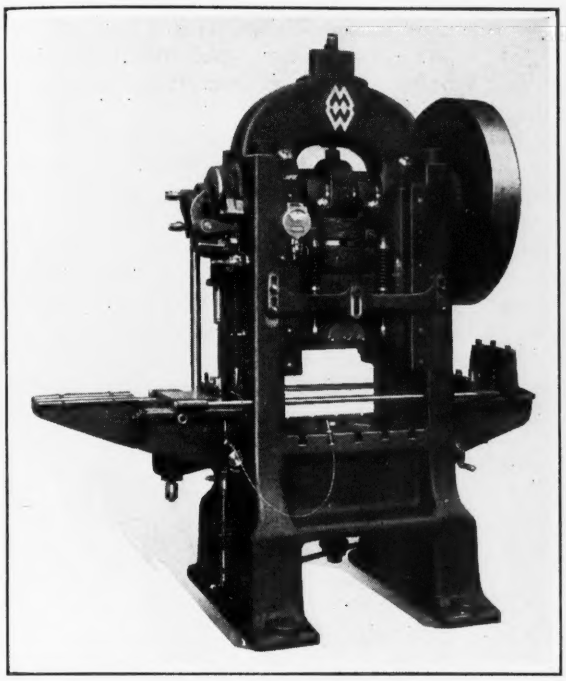
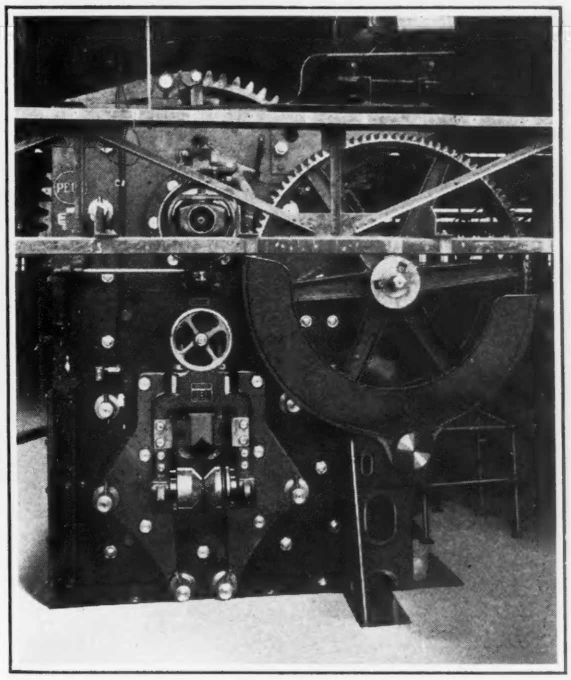


Fig. 2. Discharge End of the Two Nut-tapping Spindles of Machine Shown in Fig. 1



Schatz High-speed Press with Grip Feed



Pels Improved Heavy Billet Shears

point. Tools with or without pilot-pins can be used.

Other features of these machines include an unusually high die space, an adjustable ram, and safety features which leave the operator entirely free for feeding the strips or coils. A large amount of space is available for stacking devices, which are motor-driven on the larger models.

WELDING ROD FOR ALUMINUM WELDING

Commercial aluminum, aluminum manganese alloy, and aluminum wrought alloys can be welded successfully by the oxy-acetylene process if the metal is free to come and go with the thermal expansion and contraction of the joints being welded. For use when the aluminum sheet or casting to be welded is held tightly in jigs and is not free to move, the Oxweld Acetylene Co., 30 E. 42nd St., New York City, has introduced a new welding rod designated as Oxweld No. 23 aluminum rod. This rod coalesces readily with all the aluminum alloys and possesses high strength and good corrosion resistance. It should be used with Oxweld sheet aluminum flux and is available in three sizes—1/16, 1/8, and 1/4 inch in diameter.

PELS HEAVY BILLET SHEARS

Improvements intended to insure trouble-free clutch operation have recently been incorporated in the Type FV heavy billet shears built by Henry Pels & Co., Inc., Berlin-Charlottenburg, Germany, which concern maintains an office at 90 West St., New York City. One of these improvements consists of a band brake on the eccentric shaft, which is controlled by the clutch mechanism to stop the shaft automatically in its highest position. The other improvement consists of a special backlash pin which is built in the clutch.

The machines are equipped with knives of a new style for which a patent has been applied. These knives can be furnished for cutting square or round stock. The Type FV-75 machine illustrated is equipped with an automatic lubrication system, and has a capacity for cutting 7 5/8-inch round stock, cold.

THOMSON-GIBB WELDING MACHINES

Two welding machines incorporating many principles developed by the automotive industry were exhibited at the National Metal Exposition in Chicago by the Thomson-Gibb Electric Welding Co., Lynn, Mass., and Bay City, Mich. One of these machines was the seam welder illustrated in Fig. 1, and the other was the press welder shown in Fig. 2.

An important feature of the seam welder is that, although the driving welding roll is necessarily a slow-revolving member, the shaft and gears that drive this roll revolve at a moderately high speed. Another feature is that parts of this machine which must be replaced as they become worn out are designed to facilitate replacement with the least loss of welding time.

The driving mechanism is made up of independent units, suitably housed for lubrication purposes and easily removed for

repairing if the occasion demands. The driving mechanism consists of a motor, a four-speed gear-box for obtaining different welding speeds, a worm reduction unit, a driving head unit, a patented current interrupter, and a three-speed gear-box for changing interrupter speeds.

The vertical stroke of the upper welding roll assembly is actuated by a double-acting air cylinder. An adjustable compression spring is attached to the operating lever between the air cylinder and the upper welding head spindle. The remote control switch that actuates the main contactor for controlling the welding current will not operate until the spring is compressed a sufficient amount to exert enough pressure on the work to prevent arcing when the rolls touch the metals to be welded.

All parts subjected to the welding heat are cooled by independent lines of circulating water. Leak-proof seams made of two thicknesses of No. 14 gage material can be welded at the rate of 6 feet per minute. Lighter gages can be welded at a higher speed.

The press welder is an automatic spot welding machine with the complete driving mechanism mounted on top so as to reduce the required floor space. This machine is equipped with Timken and Hyatt roller bearings and ball thrust bearings. It is available in standard throat depths of 12, 18, 24, 30, 36, or 42 inches. Standard machines are equipped with either a 60- or a 100-kilovolt-ampere water-cooled transformer. This affords a maximum welding capacity, on machines of short throat depth, of two thicknesses of No. 10 gage material. Machines of short throat depth have a capacity for making four projection welds within a 4-inch radius at one stroke on No. 14 gage stock.

Five speed combinations are available on this press welder. The slow speed combination gives four speeds ranging from 15 to 30 strokes per minute, while the fastest combination gives four welding speeds of from 60 to 130 strokes per minute. Heavy pressure springs enable the machine to deliver pressures up to 2000 pounds. The welding head is equipped with an indicating pressure scale which facilitates the recording of the necessary pressures for resetting purposes.

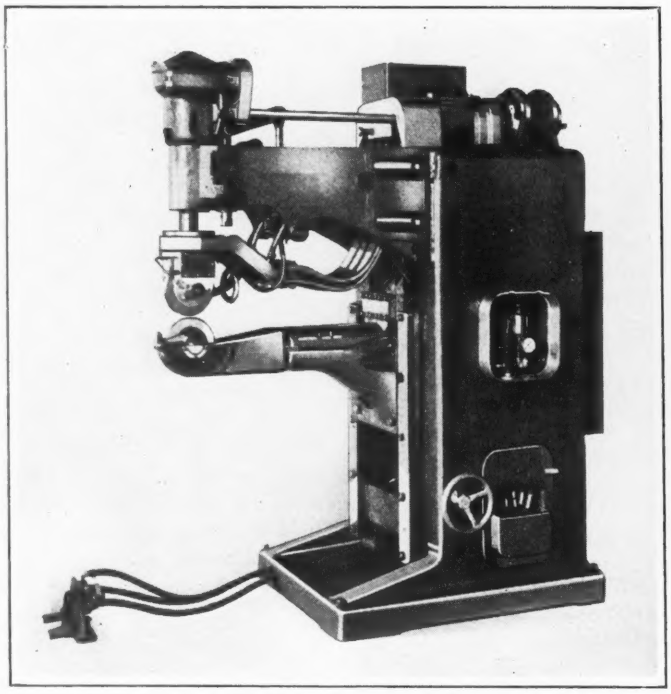


Fig. 1. Thomson-Gibb Seam Welding Machine of Improved Design

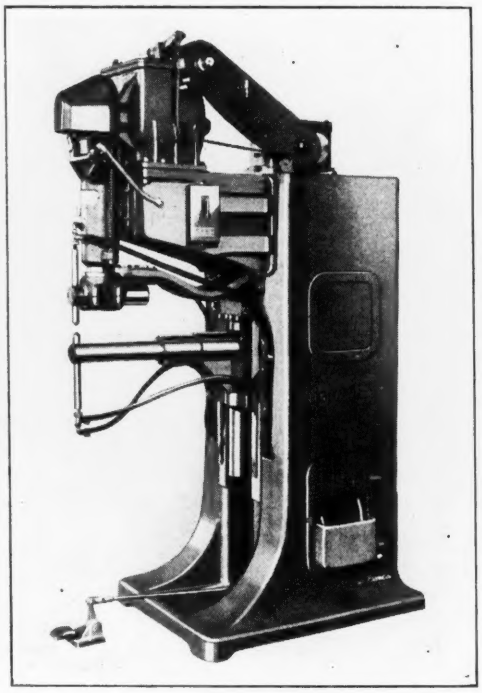


Fig. 2. Automatic Spot Welder with Driving Mechanism on Top

BLISS DOUBLE CRANK PRESS WITH ADJUSTABLE BED

Three new features are incorporated in a double crank press recently designed by the E. W. Bliss Co., Brooklyn, N. Y. These features comprise an adjustable bed with supporting blocks, which is adjusted by means of the main drive; a slide with a self-contained screw-adjustment, breaker safety device, and solid connection; and a friction clutch drive without outboard wheels or brackets.

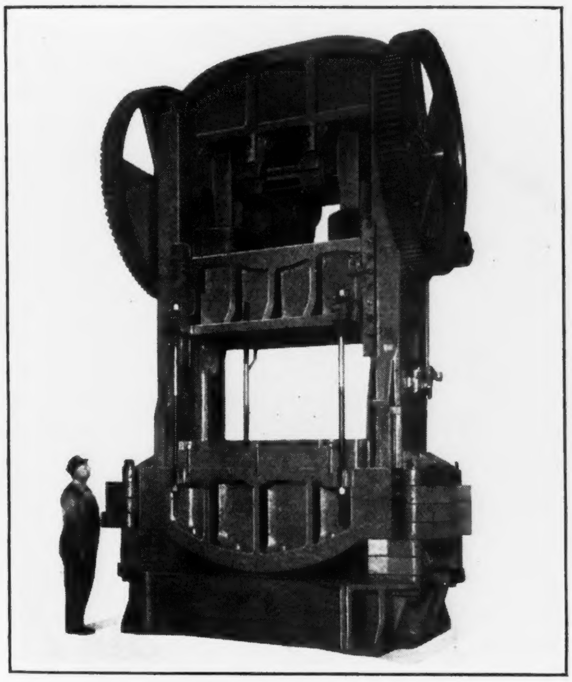
As may be seen from the illustration, the bed is gibbed to the uprights and is supported on a

system of blocks. It can be raised by connecting it to the slide through four long bolts which are applied in open lugs at the corners of the bed and of the slide. The main clutch is then operated for adjusting the bed. If the movement is to be upward, the crankshaft is turned to the bottom center, the bolts are tightened evenly, the gibs are slacked, and the shaft is then turned to the top center. This raises the bed a distance equal to the stroke.

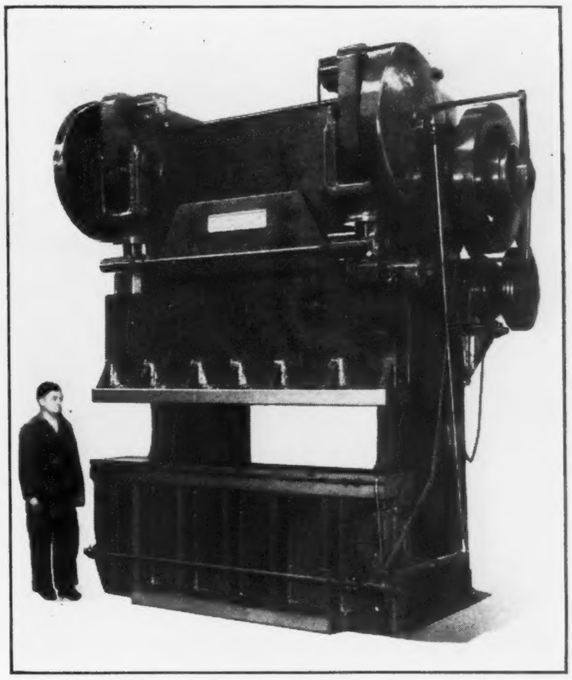
provided by the system and the entire absence of machinery in the foundation pit are distinct advantages. For shops where the bed need be adjusted only at rare intervals, the less expensive construction is another item of importance.

The connections are of a one-piece, non - adjustable design, adjustments of the slide being made by means of a screw below the wrist. The wrist sockets have a cylindrical exterior, and move in bored guides in the slide.

The press is driven by a motor on the crown, which is connected to the flywheel through "Tex-ropes." The centers permissible with this drive make it feasible to locate the flywheel inside the back brackets, with the result that the over-all width of the press does not exceed the crankshaft length. The clutch is built in the flywheel, the brake being separate from the clutch. Both the flywheel and the shaft are mounted in Timken tapered roller bearings.



Bliss Double Crank Press with New Type of Adjustable Bed



Cincinnati Press of All-steel Welded Construction

As many blocks as can be slid under the bed are then positioned temporarily for supporting it, and the crankshaft is again turned to its bottom center ready for another lift. Three such lifts are necessary for the full adjustment of the bed on the machine illustrated. After the bed has been brought to a height within the thickness of one block of the desired position, the slide adjustment is used for the final setting.

While this method of adjustment lacks some of the convenience afforded when a press is equipped with four motor-driven bed adjusting screws, it is pointed out that the improved support

CINCINNATI ALL-STEEL PRESS

A 300-ton single-acting double crank press recently built by the Cincinnati Shaper Co., Elam St. and Garrard Ave., Cincinnati, Ohio, is here illustrated. All the main members of this machine are constructed of rolled steel plate. The housings are 5 3/4 inches thick, and the bed and ram plates 4 inches thick. The various plates are joined by welding. Attention is called particularly to the welding done in constructing the bed and ram.

Aside from the all-steel construction, the principal features include an automatic oiling system, a V-belt drive to the flywheel, bronze-bushed eccentric bearings, and a flywheel and ram adjusting means which is provided with anti-friction bearings.

The stroke of the press is 3 inches, and the motor-driven adjustment to the ram 6 inches. The die surface on the ram measures 16 1/2 inches by 8 feet, and on the bed 17 1/2 inches by 8 feet. The shut height of the press is 20 inches, and the throat depth 10 inches. The particular press illustrated is to be used for multiple punching and riveting.

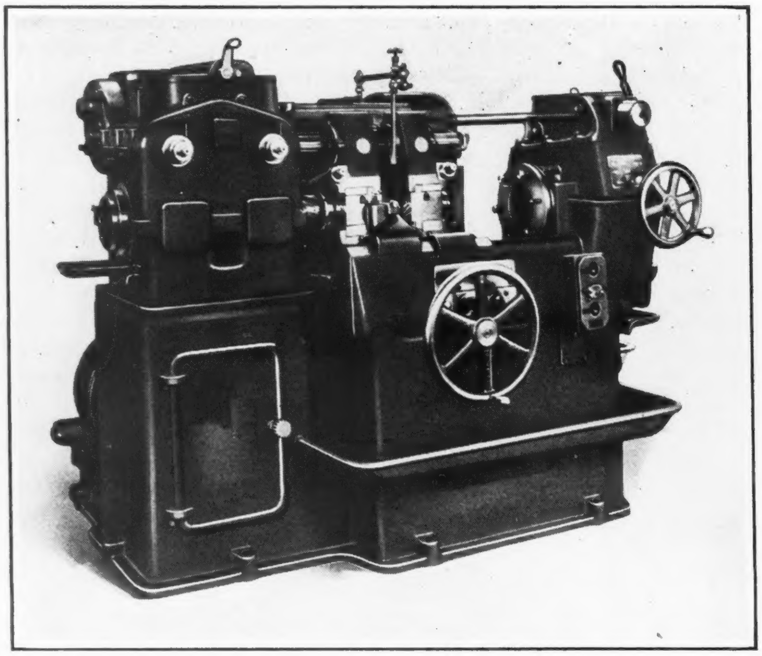


Fig. 1. Sykes Gear Generator which Makes 850 Strokes per Minute

SYKES HIGH-SPEED GEAR GENERATOR

A high-speed Sykes gear generator capable of operating at 850 strokes per minute has recently been designed by the Farrel-Birmingham Co., Inc., 344 Vulcan St., Buffalo, N. Y., primarily for use in the automobile industry. This machine has a diameter range of from 1/4 to 12 inches and will cut gears of from 24 diametral pitch up to and including 4 diametral pitch. Herringbone gears of various types, spur gears, and helical gears can be cut rapidly to a high degree of accuracy. The new machine has been designated as the No. 1-A.

Fig. 1 shows a front view of the machine and Fig. 2 a close-up view of the cutter mechanism with two helical cutters in position. The cutters are mounted face to face, so that they cut in opposite directions. An important feature of the machine is that both gears of a cluster combination are cut simultaneously, as shown in Fig. 3, whether the pitches are the same or different. The machine is also suitable for cutting gangs of gears. Herringbone gears having a groove in the center of the face, with teeth of one pitch on one side and of another pitch on the opposite side, can be produced.

It will be seen from Fig. 1 that a substantial support is provided for the outer end of the work-arbor. The maximum distance from the end of the main work-spindle to the arbor support is relatively large to permit a wide range of work to be handled. Pinions having long shafts, combination gears of the cluster variety, and spline shafts can be readily accommodated. Gears integral with crankshafts can also be cut, and the machine is adapted for generating cams and other irregular shapes.

The standard cutters are 4 inches in diameter, but cutters up to 6 inches can be used. With cutters larger than 4 inches in diameter, gears of 3 diametral pitch can be cut. The machine is fully automatic, the work being fed toward the cutters in increments which can be selected according to the material to be cut and the total depth of the teeth. The machine stops automatically when the work is finished and the work is simultaneously withdrawn from the cutters. Setting up of the machine is easily accomplished, as all adjustments and settings for the cutters are controlled by one handle.

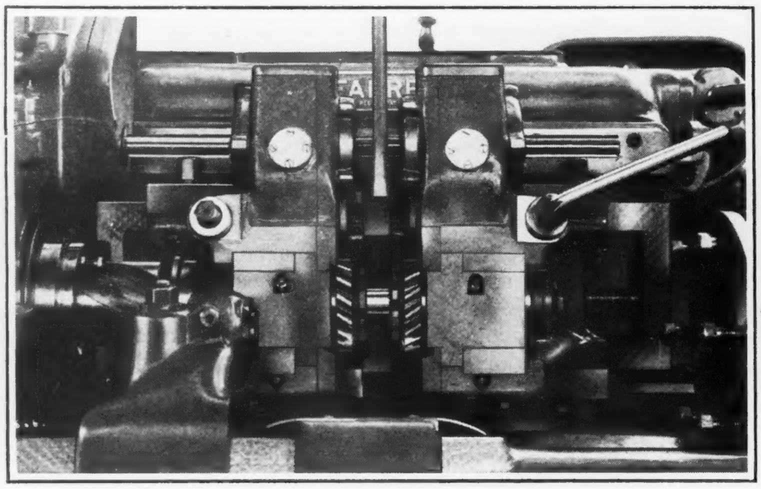


Fig. 2. View of the Cutter Mechanism with Two Helical Cutters in Position

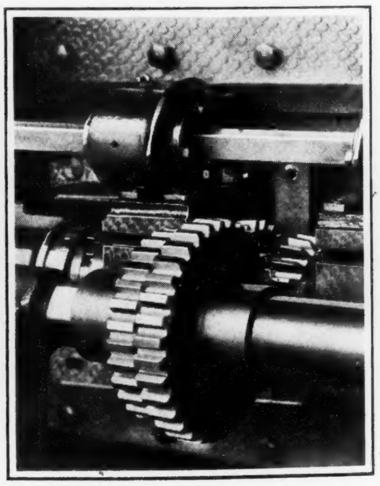
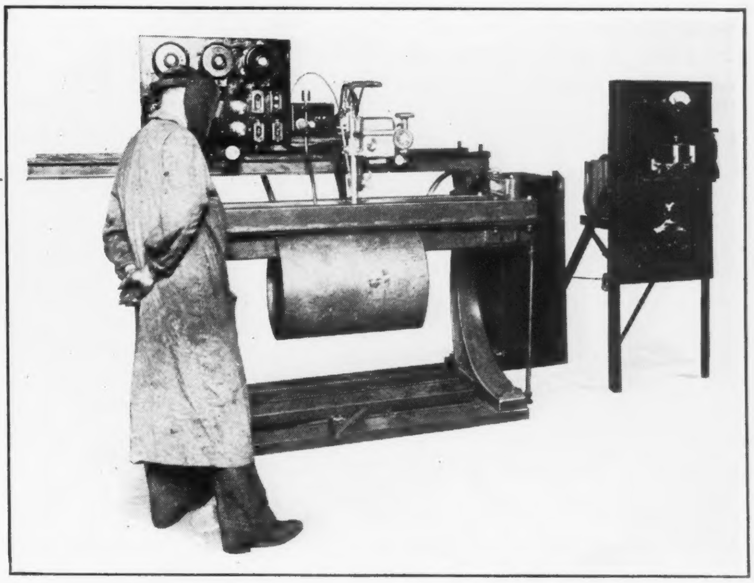


Fig. 3. Cutting Two Cluster Gears at Once

The guides used for helical and straight-tooth gears have double grooves instead of single grooves, as on previous machines. The shoes that engage these grooves are easily adjusted to eliminate backlash and to compensate for wear. A new relief mechanism that is positive and silent in action has been incorporated in the machine. When the cutters are in the cutting position, they are securely locked. This machine occupies a floor space of 6 feet by 4 feet 7 inches and has a shipping weight of about 7500 pounds.



Atomic Hydrogen Welding Machine that is Automatic in Operation

GENERAL ELECTRIC WELDING MACHINES

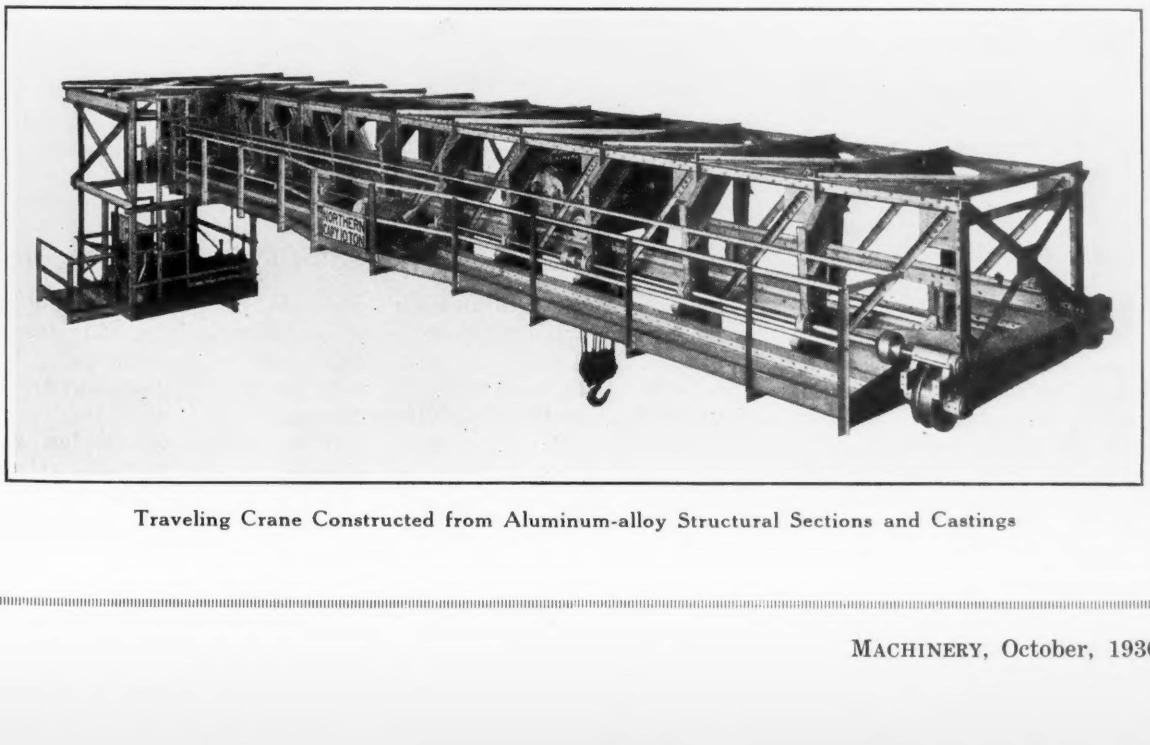
An atomic hydrogen welding machine that operates automatically was shown by the General Electric Co., Schenectady, N. Y., at the National Metal Exposition held recently in Chicago. This equipment is designed for welding longitudinal seams. It consists of a clamping mechanism for holding the work, an automatic traveling carriage, a welding head, control device, and other accessories. The welding head, control, etc., are of a special design to suit atomic hydrogen welding.

This welding process enables hitherto unweldable metals to be melted and fused without trace of oxidation. In some cases, the welding can be performed on metals as thin as ordinary writing paper.

Another machine exhibited by the same concern was a semi-automatic arc-welding equipment that can be used for either open or shielded arc-welding. Only a simple adjustment is necessary to adapt the equipment for either method. This welder consists of a head for feeding the electrode, an enclosed line contactor with an interlock, and a field rheostat for controlling the motor on the welding head, as well as a welding tool and lead for directing the electrode toward the work. The welding head is simply a motor-driven device for feeding the electrode wire. An electrode up to 5/32 inch in size can be handled conveniently.

NORTHERN ALUMINUM CRANES

Six overhead traveling cranes constructed almost entirely from aluminum alloys have recently been built by the Northern Engineering Works, 210 Chene St., Detroit, Mich., for the new sheet rolling mills of the United States Aluminum Co., which are located at Alcoa, Tenn. The bridges and trolleys of these cranes are

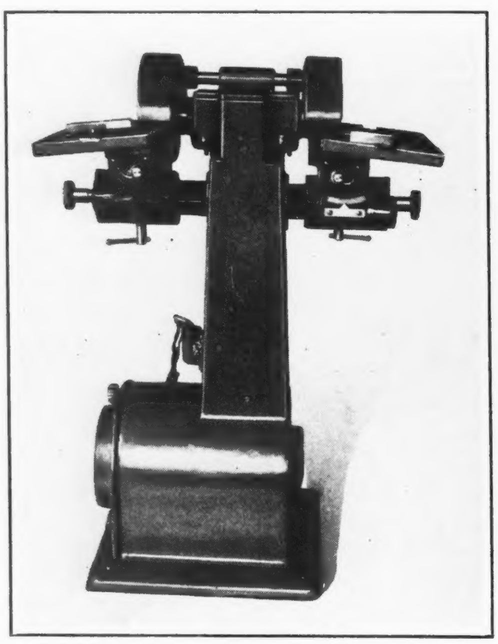


Traveling Crane Constructed from Aluminum-alloy Structural Sections and Castings

made up of aluminum-alloy rolled structural sections and aluminum-alloy castings.

The crane illustrated has a capacity of 10 tons. The span of the bridge is 76 feet 6 inches between the truck wheels, and the lifting height of the hoist hook is 25 feet. The mill-type motors for driving the hoist, bridge, and trolley operate on 220-volt direct current. They are equipped with a full magnetic control, which is placed in the operator's cab. The hoist operates at a full load speed of 50 feet per minute, being driven by a 19-horsepower motor, while the bridge, fully loaded, travels at a speed of 400 feet per minute and is also driven by a 19-horsepower motor. The trolley travels at a speed of 150 feet per minute, and is driven by a 4 1/4-horsepower motor.

The net weight of the crane, including the trolley, is 30,000 pounds, whereas if the bridge and trolley were constructed of steel instead of aluminum, the weight would be approximately 77,000 pounds. Thus the use of aluminum effects a saving in weight of about 47,000 pounds.



Oliver Double-unit Grinder Designed for Sharpening Tungsten-carbide Tools

Diamond Surface Grinding Machine for Finishing Dies, Punches, Cutters, and Other Precise Work

OLIVER GRINDER FOR TUNGSTEN-CARBIDE TOOLS

A grinder primarily designed for sharpening tungsten-carbide tools has just been placed on the market by the Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich. As will be seen from the illustration, this machine consists of a double-end grinding stand, equipped with a 9-inch cup-wheel having a 2-inch face at each end of the spindle. The grinder is driven by a one-horsepower motor located in the pedestal base. With this double unit, tools can be completely ground without changing the grinding wheels.

There is a table for each wheel, and both tables can be adjusted relative to the wheels by means of hand-knobs and locked in position. The top of each table has a guide slot parallel to the wheel face in which a protractor slides for guiding the tools accurately. The protractor is graduated up to 50 degrees on either side of the center. Grinding is done free-hand, the tool being held against the protractor at the proper angle. By the use of this method, it is possible to grind the tools both quickly and accurately.

A diamond wheel dresser, which also slides in the table slots, insures that the wheel faces will always be parallel with the tool guides. The tables can be tilted 25 degrees, graduations being provided for setting them at the desired angle. The weight of this machine is approximately 600 pounds.

DIAMOND SURFACE GRINDING MACHINE

A high-speed hydraulically driven surface grinding machine known as the Type G is being introduced on the market by the Diamond Machine Co., 9 Codding St., Providence, R. I., for accurately finishing such parts as dies, punches, thrust collars, spacers, and flat or formed cutters. Work up to 7 1/2 inches wide, 22 inches long, and 9 inches high can be accommodated beneath a 10-inch diameter grinding wheel.

Two means of moving the wheel-head are provided. There is a coarse-feed elevating handwheel on the front of the bed by

means of which the wheel-head can be raised or lowered rapidly. In addition, there is an elevating micrometer-feed handwheel located at the left of and slightly above the abrasive wheel. This micrometer-feed handwheel is graduated on its face to 0.0001 inch for accurately feeding the wheel downward.

A feature of the spindle housing construction is that the overhang is much less than the length of the vertical ways. The spindle is mounted in ball bearings and is driven through a V-belt and sheaves. The motor is mounted on an adjustable base so that the proper driving tension may be maintained. Two-step sheaves can be provided to permit the spindle speed to be increased for small wheels.

The power cross-feed at each end of the table travel is effected hydraulically. The amount of cross-feed is easily regulated by means of an adjustable crank. There is also a hand cross-feed which can be employed after the power cross-feed has been disengaged by turning a knob. Longitudinal operation of the table at high speeds is effected hydraulically, the maximum table speed being in excess of 50 feet per minute. The table can also be operated longitudinally by hand. A magnetic chuck can be supplied. The table ways are oiled automatically from the hydraulic drive system.

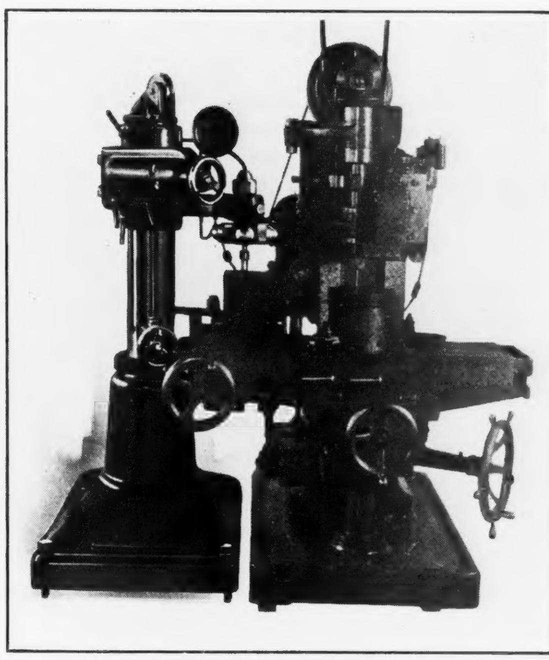
"TOM THUMB" PIPE MACHINE

All sizes of pipe from 1/4 to 1 1/4 inches can be cut off, threaded, reamed, and chamfered in what is claimed to be the smallest complete pipe machine on the market. This machine has recently been brought out by the Oster Mfg. Co., Cleveland, Ohio, and the Williams Tool Corporation, Erie, Pa. The over-all dimensions of this equipment are 18 1/2 by 16 by 23 1/2 inches, including the 1/2-horsepower universal motor. The motor adjusts its speed automatically to suit the pull on the dies.

Through the use of a special chuck, bolts from 3/8 to 1 1/2 inches can also be threaded in the machine. Timken tapered roller bearings are furnished throughout.

WALCOTT TRANSCRIBING EQUIPMENT

Transcribing equipment designed for use in all kinds of profiling work is now being manufactured by the Walcott Machine Co., Jackson, Mich. This equipment can be used with any vertical-type milling machine, thus making a die-sinking machine available at a comparatively low cost. In a die-sinking operation, a plaster mold of the form to be cut in the die-block is placed on the table of the milling machine at the left side of the spindle, as shown in the illustration. The plaster mold is then lined up with the die-block by means of pointers inserted in the transcribing equipment and in the head of the milling machine.



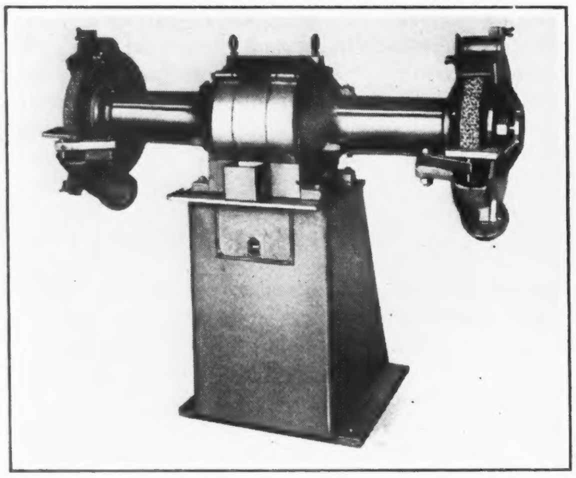
Equipment which Facilitates Die-sinking on a Milling Machine

After the work has thus been centered, a cutter is mounted in the head of the milling machine and a "follow-button" corresponding to the form of the cutting tool is attached to the head of the transcribing equipment. Next the table of the milling machine is adjusted to bring the cutter about 0.004 inch above the face of the die-block, after which the arm of the transcribing equipment is lowered until the "follow-button" just touches the top face of the plaster mold.

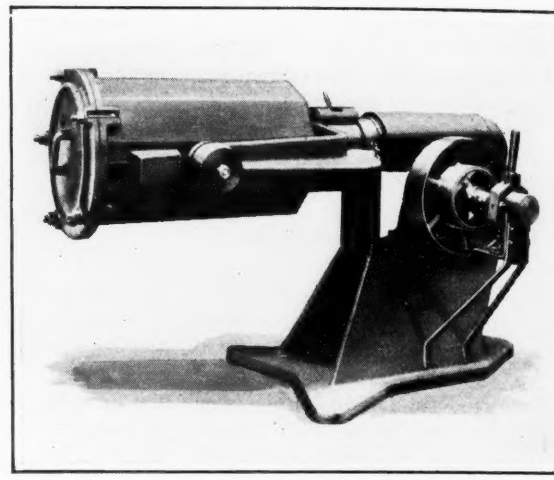
The operator is now ready to transcribe the form of the mold to the face of the die-block. He feeds the table of the milling machine in such a way that the transcriber "follow-button" comes in contact with the pattern. This causes the rotating cutter of the milling machine to produce the same shape in the die-block.

Accuracy of the operation is controlled by means of a visible station which signals to the operator the direction or directions in which to feed the milling machine table in order to duplicate the mold impressions in the die-block. For example, when the operator has gone deep enough, the center signal light of the visible station goes out; when he has gone far enough to the right, the right-hand light goes out; and so on.

One plaster mold is usually satisfactory for reproducing as many as fifty dies. When larger quantities are required, the first die can be used as a guide in making the others. This equipment can also be adapted for use on milling machines having heads that move vertically. In such cases, the base is discarded and the remainder of the equipment is mounted on the vertical head.



Heavy-duty Grinder with Completely Enclosed Motor



Crown Burnishing Machine Driven by Spiral Gears

HEAVY-DUTY EXTENDED-SPINDLE GRINDER

The heavy-duty, extended-spindle grinding machine here illustrated has been added to the "One Profit" line of machines manufactured by the Production Equipment Co., 5213 Windsor Ave., Cleveland, Ohio. This machine is particularly adapted for handling pieces of an awkward shape. The motor is completely enclosed to exclude all dust, dirt, and grit from the windings and bearings. It requires no ventilation. The base and guards are made from steel forms welded together. Four heavy-duty ball bearings, two in each extended arm, are furnished for the spindle.

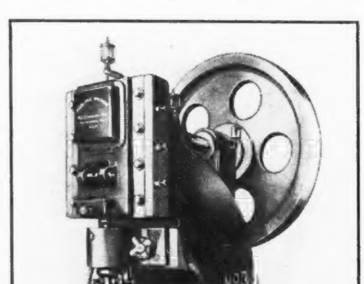
CROWN BURNISHING MACHINE

A spiral gear drive is the main feature of the burnishing machine here illustrated, which is being introduced on the market by the Crown Rheostat & Supply Co., 1910 Maypole Ave., Chicago, Ill. It is claimed that with this drive, starting is much easier than if the machine were driven directly by a pulley or shaft.

The machine can be furnished with either a belt or a motor drive, and is equipped complete with clutch pulleys. It is made in two models, the No. 1 having a capacity for one bushel of work, and the No. 2 for three bushels. The machine weighs about 2250 pounds, and is designed to operate with minimum vibration under heavy loads at full speeds.

CAMPBELL NIBBLING MACHINE

Sheet metal from 3/8 to 3/4 inch thick can be cut to various shapes in a No. 3 nibbling machine which has recently been added to the products of A. C. Campbell, Inc., Bridgeport, Conn. This machine cuts at the rate of approximately 20 linear inches per minute. Like the smaller nibbling machines made by this concern, it works on the circular punch and die principle. A pilot prevents the work from slipping and the punch from taking too large "bites."



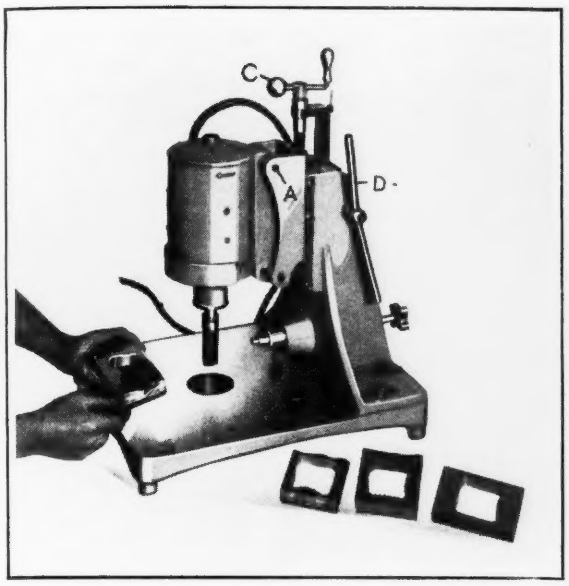
Campbell Nibbling Machine

Circles can be easily cut by means of an attachment furnished with the machine. Original pieces may be used as templets for cutting duplicate pieces. The machine operates at three different strokes, of 1/2, 13/16, and 1 inch. The net weight of the equipment, belt-driven, is 9000 pounds. The depth of throat is 15 inches.

"GRINDRITE JR." BENCH GRINDER

A bench grinder designed to save time in finishing die sections and similar work has been brought out by the Koestlin Tool & Die Corporation, 3601 Humboldt Ave., Detroit, Mich. This equipment, which is known as the "Grindrite Jr.," is shown in the illustration, together with specimens of the work for which it is particularly adapted.

This grinder is equipped with a 1/2-horsepower vertical grinding head which takes four interchangeable grinding wheels, 1/2, 3/4, 1, and 2 1/2 inches in diameter by 1 3/4 inches face width. Under no load, the motor runs at 12,500 revolutions per minute, and the minimum speed at full load is 7500 revolutions per



Koestlin "Grindrite Jr." for Finishing Die Cavities and Similar Work

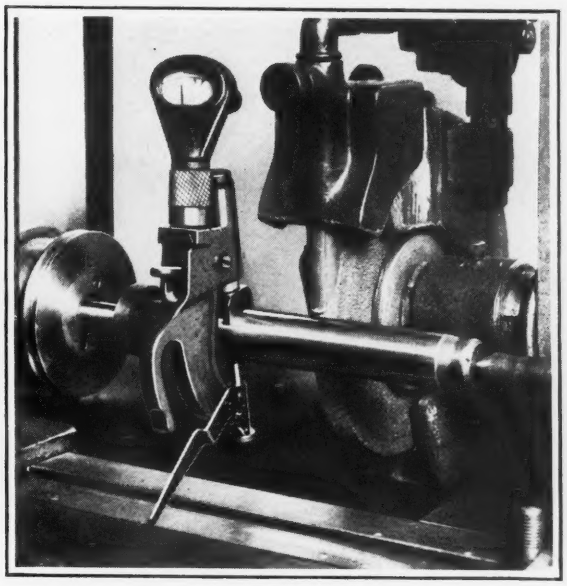


Fig. 1. "Mikrotast" Gage Designed for Use in Cylindrical Grinding

minute, using the 2 1/2-inch wheel. The minimum full-load speed increases as the size of the wheel is decreased. The machine occupies a bench space of 14 by 18 1/2 inches, is 20 inches high over all, and weighs 125 pounds.

The grinding head is supported on a pivot *A* about which it may be swung 5 degrees in either direction to grind the required clearance in dies. A graduated scale facilitates accurate settings. Diamond dresser *B* is advanced by means of a hand-screw for resurfacing the wheel. In setting up the machine for a job, vertical adjustment of the grinding wheel is accomplished by turning handle *C*, and the setting is locked by a screw.

In performing internal grinding operations, it is desirable to lift the wheel clear of the work for inspection. This is done through a quick-acting toggle mechanism operated by means of lever *D*. In grinding short and long pieces of work with one of the small-size "stick wheels," it is preferable to have the wheel close to the front of the opening in the machine table. By loosening four screws, the column and grinding head can be moved forward into the desired position and the column then quickly re-clamped.

"MIKROTAST" GRINDING AND WIRE GAGES

Two additional "Mikrotast" gages made by Friedrich Krupp A. G., Essen, Germany, are being introduced on the American market by the Coats Machine Tool Co., Inc., 110-112 W. 40th St., New York City. One of these devices is the portable grinding gage shown in Fig. 1, which has been designed for checking work on cylindrical grinding machines without stopping the machine. To offset the abrasive action of the rotating work, all contact points are faced with Widia metal.

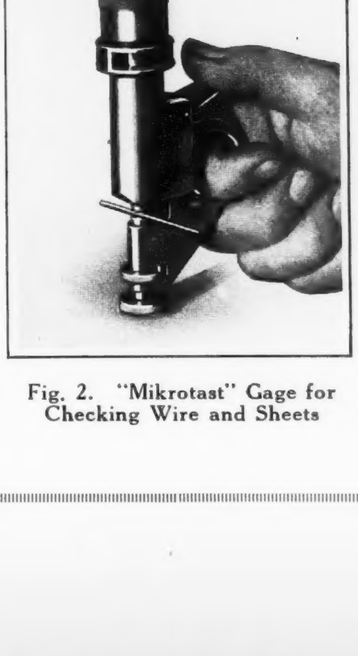


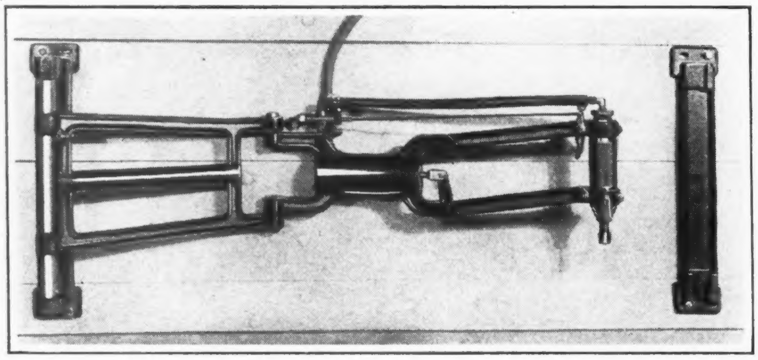
Fig. 2. "Mikrotast" Gage for Checking Wire and Sheets

Pressure of the thumb on the lever of this gage will raise the V-shaped upper jaw. The gage can then be snapped on the work and will be held there by this jaw and the adjustable support that rests against the bed of the machine. The gage is easily removed from one machine for immediate use on another. This gage is made in five sizes, covering a range of from 1 1/4 to 8 inches. It is graduated to either 0.0001, 0.0002, 0.0005 or 0.001 inch.

The device shown in Fig. 2 has been designed for gaging fine wire up to 7/32 inch. The back-stop shown may be removed for gaging thin sheets. This gage is graduated in forty divisions of 0.00005 inch or in fifty divisions of either 0.0001, 0.0002, 0.0005 or 0.001 inch.

"AIRFLEX" RIVETING HAMMERS

A line of fast-operating riveting hammers known as the "Airflex" has been placed on the



"Airflex" Riveting Hammer with Sensitive Power-feed Control

market by the Walcott Machine Co., Jackson, Mich. These hammers are suitable for use in a large variety of assembly operations. One of the features is a patented holding device which keeps the hammers vertical, permits unusual flexibility, and provides a large working area. This holding device slips into a bracket that can be mounted on a wall, post, or other convenient place. By installing two or more brackets, it is easy to move the equipment from place to place.

When attached to a wall, the holding device makes it possible to place the tool in any location within a half circle having a radius of 42 inches, and when mounted on a pedestal or a post, the working range is increased to a three-quarter circle of the same radius. By adding elbow bracket sections, the radius can be extended.

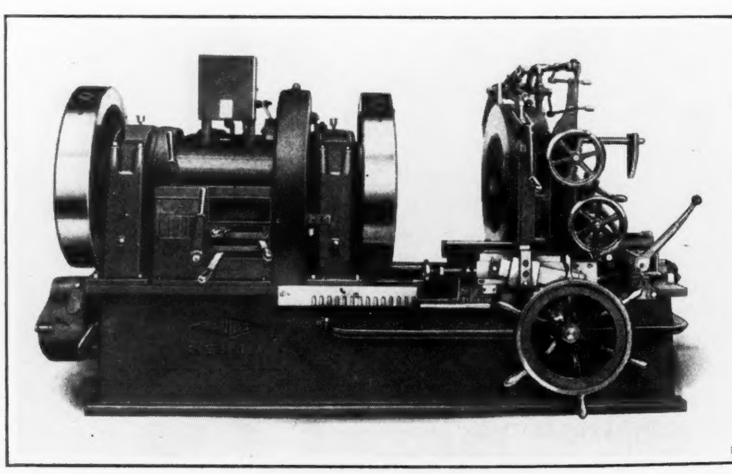
The holding device, together with a sensitive power-feed control, adapts the tool especially for light work. It is stated that materials as fragile as glass can be riveted without injuring the work or distorting the rivet. The speed and power are regulated through a patented throttle control valve. Four thousand blows can be struck per minute.

There are two general models, a wall model and a pedestal model. Each of these comes in three sizes, the smallest of which will handle 5/32-inch rivets; the second size, 1/4-inch rivets; and the third size, 3/8-inch rivets.

LANDIS PIPE THREADING AND CUTTING MACHINE

A pipe threading and cutting machine with a receding chaser, two-cut die-head, and lead-screw attachment will be exhibited by the Landis Machine Co., Inc., Waynesboro, Pa., at the National Petroleum Exposition to be held in Tulsa, Okla., from October 4 to 11, inclusive. This machine is designed to produce the long lengths of tapered threads required by users of high-pressure pipe and oil-tubing. The receding chaser makes it possible to cut long threads with narrower and lower-priced chasers than before. This design also increases the life of the chaser between grinds and reduces the power consumption for threading operations.

The chasers are 1 15/16 inches in width, regardless of the total thread length. They have a combination turning and threading throat, the scale and surplus stock being removed by the turning section. The same chasers can be used for any pipe size within the range of the die-head as long as the pitch, taper, and thread form remain constant.



Landis Pipe Threading Machine with Receding Chaser, Two-cut Die-head and Lead-screw Attachment

The two-cut die-head permits roughing and finishing cuts to be taken without changes in the diametral adjustment. Both the roughing and finishing cuts are controlled by one taper mechanism. Coolant is supplied to the chasers internally through holes in the bore of the die-head. The sine bar of the taper mechanism is quickly adjusted for all tapers up to and including 3/4 inch per foot. The lead-screw attachment, with change-gears for the different pitches, is designed to insure a true start of the thread and an accurate lead. A pitch indicator assists the operator in the engagement of the lead-screw nut.

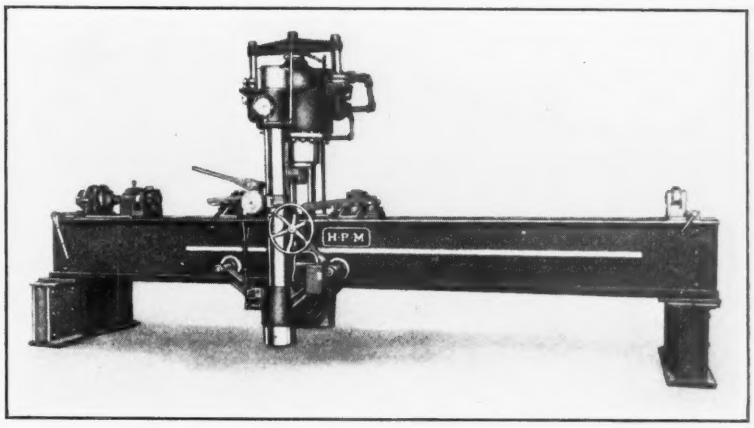
HYDRAULIC SHAFT STRAIGHTENING PRESSES

A complete line of hydraulic presses intended for production service in straightening shafts, axles, bars, rods, etc., has been brought out by the Hydraulic Press Mfg. Co., Mount Gilead, Ohio. The presses of this line are designed particularly for handling long or heavy work that cannot be moved back and forth under the ram conveniently. To

take care of this class of work, the pressure unit is so arranged that it can be moved along the bed for applying pressure on the work at any distorted point.

The patented "Fastraverse" oil pressure system employed for moving the ram to and from the work quickly makes high production possible. Both the direction and the speed of the ram are governed by a precision manual control which includes a conveniently located hand-lever. When this lever is in the middle position, the press is at rest. When it is moved forward from neutral, the ram will move forward, and when it is reversed, the ram will return. Furthermore, the speed of the ram is proportional to the distance that the lever is moved from the neutral position in either direction.

Six standard sizes of presses are available in this line having capacities of 75, 100, 150, 200, 300, and 400 tons, respectively. One of the largest sizes is shown in the illustration.

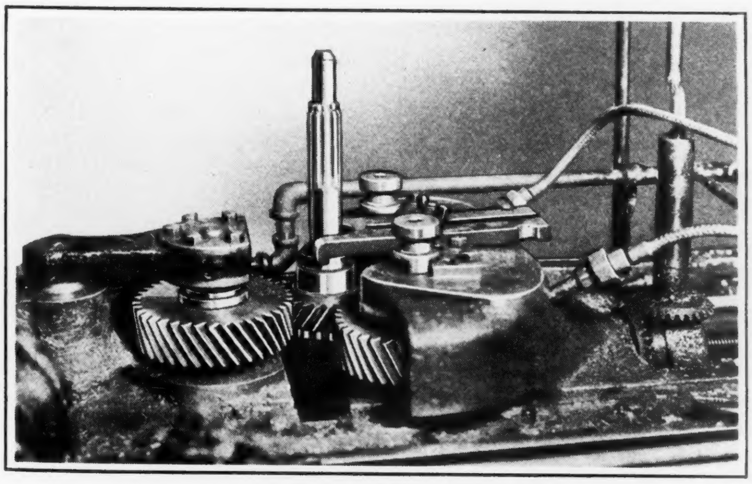


Hydraulic Press for Straightening Shafts, Axles, Bars, and Similar Parts

FIXTURE FOR GEAR BURNISHING MACHINES

An attachment recently brought out by the City Machine & Tool Works, 1517-31 E. Third St., Dayton, Ohio, for application to the Bolender gear burnishers made by that concern enables spiral gears to be burnished satisfactorily. Readers of the article describing burnishing machines of this type that was published in May MACHINERY, page 727, will remember that in the burnishing operation, the gears are run a specified number of revolutions in one direction and are then revolved in the reverse direction the same number of revolutions. When spiral gears are burnished under load in one direction, they tend to rise, and when burnished in the other direction, they tend to lower.

The new fixture, which is here illustrated, checks the upward thrust of a spiral gear while it is being burnished when rotated in one direction. The downward thrust produced when the gear is rotated in the opposite direction is taken care of by a locater plate.



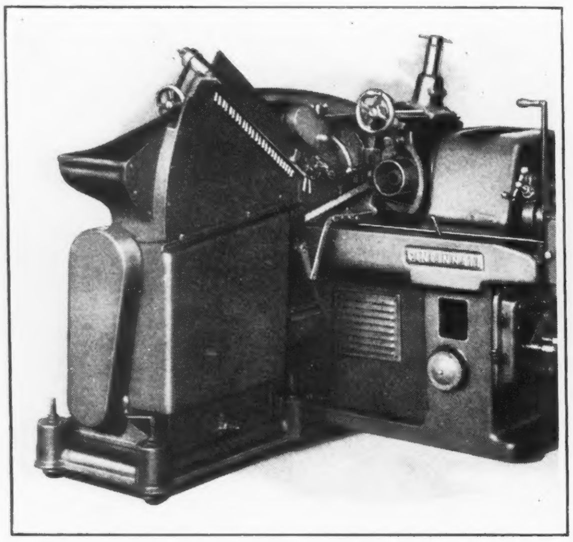
Fixture Applicable to Bolender Gear Burnishers to Facilitate the Burnishing of Spiral Gears

HOPPERS FOR CINCINNATI CENTERLESS GRINDERS

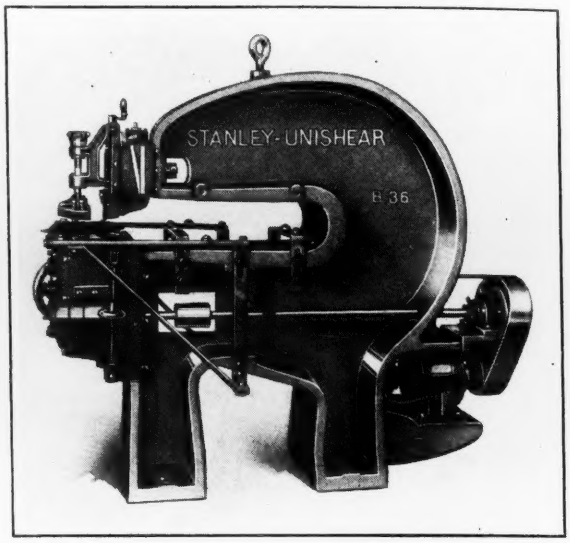
A number of improvements have been incorporated in the design of the "Feed-Matic Thru-Feed and In-Feed" hoppers made by Cincinnati Grinders, Inc., Cincinnati, Ohio, for automatically feeding work to centerless grinding machines. The low work basin of the improved hoppers makes dumping of work easier for the operator, and one man can tend three or four machines. The hoppers have an individual motor drive, are portable, and are quickly adjusted to suit different sizes of work. The mechanical arrangement is such that jamming of work or injury to the mechanism is eliminated.

The illustration shows the "Feed-Matic In-Feed" hopper set up for feeding headed or shouldered work. Work up to 8 inches under the head, with a head diameter up to 2 inches and with a ground diameter up to 1 1/2 inches, can be handled. The one-half horsepower motor drives a pick-up plate which travels in the work basin and selects work with the shoulder end up. The pieces slide down a chute and are placed in position on the work support blade. An ejector rod on the automatic in-feed attachment controls the timing of the hopper.

The "Feed-Matic Thru-Feed" hopper is identical in construction to the in-feed type, except that it does not have the arrangement for automatic in-feeding.



Hopper which Automatically Feeds Headed or Shouldered Work to Cincinnati Grinders



Stanley "Unishear" with a Capacity for Cutting Boiler Plate up to 1/4 Inch

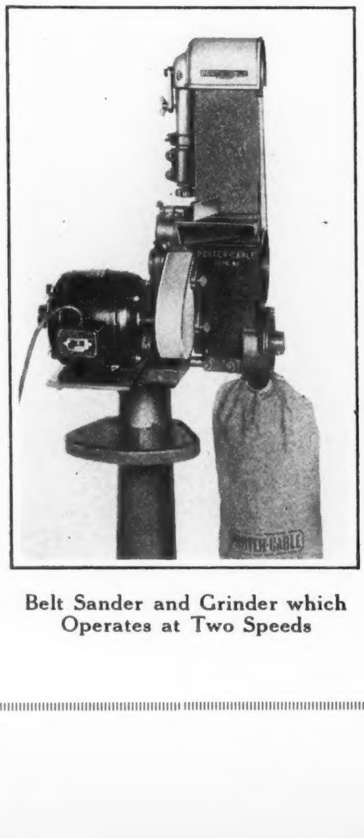
In the place of this mechanism is a gravity chute down which the straight cylindrical parts slide to the work support blade. This hopper takes work from 1/8 to 1 1/2 inches in diameter and up to 8 inches in length, if the length exceeds the diameter.

SYRACUSE BELT SANDER AND GRINDER

Two speeds are available instantly on a Type B-9 belt sander and grinder recently designed by the Porter-Cable Machine Co., Salina and Wolf Sts., Syracuse, N. Y. This arrangement provides the proper surfacing speed for wood and metal. The speed is changed by simply lifting the motor and placing the belt in the proper grooves of the motor and drum pulleys. The motor weight automatically takes up any slack of the V-belt.

Another feature is the vacuum dust-collecting system which is built right in the machine. This system consists of a frame located in the lower dust chute, which is driven from the drum pulley by a V-belt. Most of the dust is carried through the chute into the bag or is conveyed elsewhere by attaching a flexible pump to the machine.

Abrasive belts can be changed without removing the guard or idler pulley. This machine can be used in either a vertical or a horizontal position, as the work requires. Changes in position can be made by simply loosening two wing-screws.



Belt Sander and Grinder which Operates at Two Speeds

STANLEY "UNISHEAR"

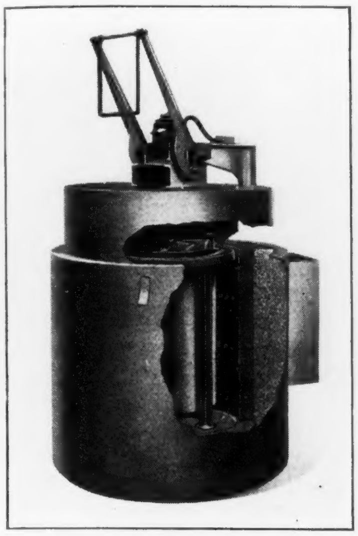
A Type B "Unishear" having a capacity for cutting boiler plate up to 1/4 inch has been added to the machines of this line made by the Stanley Electric Co., New Britain, Conn. This machine operates on the same cutting principle as the "Mighty Midget" manufactured by this company. However, the new machine is much larger, having a throat of either 36 or 50 inches. With the 36-inch throat the machine weighs about 5500 pounds, and with the 50-inch throat, 7500 pounds.

Plates can be cut to any desired outline at a speed up to 10 feet per minute. The equipment can be obtained with either a motor or a belt drive.

AIR-TEMPERING AND HIGH-TEMPERATURE FURNACES

The construction of a new air-tempering furnace exhibited by the General Electric Co., Schenectady, N. Y., at the National Metal Exposition held in Chicago, is shown in the accompanying illustration. This furnace is designed for drawing steel at temperatures up to 1200 degrees F. It embodies the same heating-unit construction as that employed in heat-treating furnaces of higher temperatures built by this concern.

The heating units are made of heavy nickel-chromium ribbon and are located on the inside wall of the furnace, the units being so placed that they present a



Air-tempering Furnace Made by the General Electric Co.

maximum surface area to the air. A fan made of heat-resisting alloy circulates air in large volume through the charge. The air temperature is controlled positively and automatically.

Parts to be tempered are placed in a basket and lowered into the furnace, alloy guards being furnished for guiding the basket in and out. A limit switch throws on the power and fan when the furnace cover is closed. As the cover is opened, the power circuit is interrupted and the fan stopped.

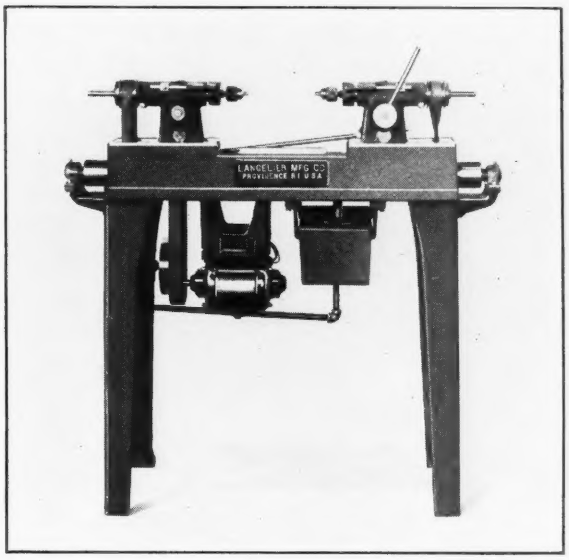
The General Electric Co. has also added to its line of heat-treating equipment a production type furnace suitable for temperatures up to 2600 degrees F. This furnace is especially applicable for processes that must be carried on in a reducing atmosphere, such as copper brazing or the brazing of Carboloy to steel. The heating element consists of molybdenum wire and operates in a hydrogen atmosphere.

LANGELIER DUPLEX DRILLING MACHINE

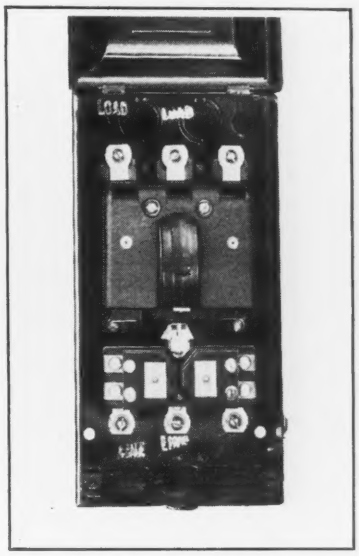
A horizontal duplex drilling machine of the construction illustrated has been added to the line of production machines built by the Langelier Mfg. Co., Providence, R. I. This equipment has a capacity for driving drills up to 3/8 inch in steel. The drilling heads can be adjusted from 3 to 16 inches apart between the chuck ends, and the distance from the center of the spindles to the table is 6 3/8 inches.

Gibbed T-slides are provided at each end of the bed, in which the drilling heads can be located and clamped. The drilling spindles are equipped with deep-groove radial ball bearings to counteract the drilling thrust. Spindle speeds of from 1200 to 6000 revolutions per minute are available. The spindles are provided with No. 2A Jacobs chucks. The drilling heads are fed simultaneously by means of a connecting-rod and levers.

Both spindles are driven by belts extending from a jack-shaft located inside the bed. The jack-shaft runs in four ball-bearing pillow-blocks and is driven, in turn, by a motor mounted under the bed. The motor is attached to a swing baseplate that provides means for taking up belt stretch. Coolant is delivered to the drills by a gear pump from a tank fastened to the under side of the bed. The machine occupies a space of 50 by 22 inches, and weighs about 525 pounds.



Langelier Duplex Drilling Machine Having a Capacity for Driving 3/8-inch Drills in Steel



Starting Switch with Resettable Overload Protection

WESTINGHOUSE "MOTOR WATCHMAN"

A small inexpensive motor starting switch with a resettable automatic overload protection is being placed on the market by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. This "Motor Watchman," as the switch is called, is especially suitable for use with machine tool motors, because it can be reset rapidly. Thus it permits rapid resumption of production.

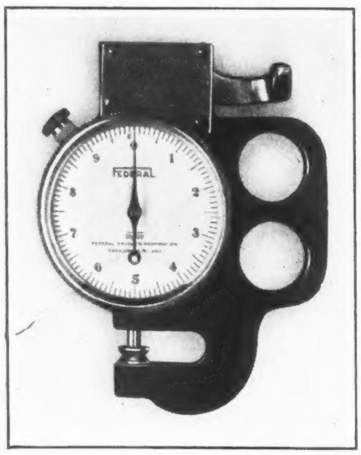
Switches of all ratings are enclosed in a box 9 inches long, 4 7/8 inches wide, and 3 11/16 inches deep. Therefore, machine tool builders only need to design for one size of box. Other features are front handle operation and the choice of top or bottom line terminals. The contacts are made of a special alloy.

FEDERAL DIAL THICKNESS GAGE

A dial thickness gage known as the Model 390 has been added to the line of precision measuring instruments manufactured by the Federal Products Corporation, 1144 Eddy St., Provi-

dence, R. I. This gage is graduated to 0.0001 inch, but is similar in other respects to another gage manufactured by the concern, which is graduated to 0.001 inch.

The spindle of the new gage is raised by pressing down on the



Dial Thickness Gage Graduated to 0.0001 Inch

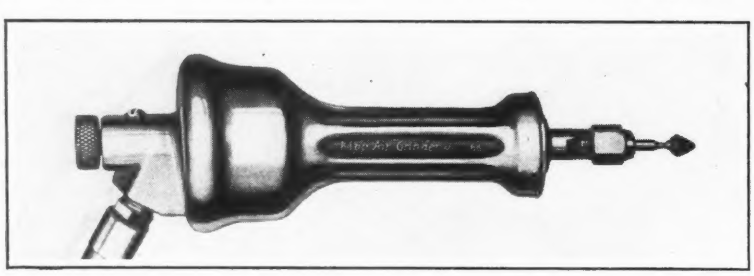
small lever at the top of the instrument, the range of spindle movement being 0.100 inch. The throat depth is 3/4 inch. This instrument is intended for use in measuring all kinds of flat materials, such as sheet metal, leather, felt, and glass.

MADISON-KIPP AIR GRINDERS

Five types of air grinders are now included in the line manufactured by the Madison-Kipp Corporation, 203 Waubesa St., Madison, Wis. Two of these models, which were described in February, 1930, MACHINERY, page 473, run at a speed of 40,000 revolutions per minute and operate on an air pressure of from 20 to 100 pounds per square inch. Recent models added to the line operate at speeds of 60,000 and 100,000 revolutions per minute with an air pressure of from 30 to 120 pounds per square inch.

In the grinders that run at the two higher speeds, the spindle is carried in ball bearings at both ends. The spindle has also been shortened in order to reduce any tendency for whip to develop in the shaft. The higher speeds are obtained through the introduction of additional air ports for delivering air to the turbine and through the use of air at a higher pressure.

The three new models are adapted for continuous operation, whereas the first two models are designed for intermittent use in die shops, etc. The high-speed grinders are furnished with a hollow spindle that is cross-drilled with 1/32-inch holes in order to enable oil to be delivered to the ball bearings by centrifugal force.



Madison-Kipp Air Grinder which Operates at High Speed

PORTABLE ELECTRIC AND PNEUMATIC TOOLS

Two drills, two screwdrivers, and a die grinder have been added to the line of "Hicycle" portable electric tools manufactured by the Chicago Pneumatic Tool Co., 6 E. 44th St., New York City. These tools are all of the general construction shown in Figs. 1 and 3. The drills are designed for producing holes up to 3/16 inch in such work as airplane structures, automobile bodies, metal furniture, and sheet-steel filing cabinets. The drills weigh 4 pounds or less and are 9 1/2 inches or under in over-all length. They operate at

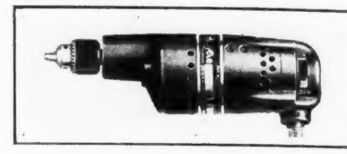


Fig. 1. "Hicycle" Drill of 3/16 Inch Capacity

a free speed of either 2700 or 4000 revolutions per minute, and at a loaded speed of either 2500 or 3700 revolutions per minute.

The screwdrivers are intended for the same classes of work. They weigh 5 pounds or less and are 10 1/8 inches or under in over-all length. These tools have a free speed of either 500 or 750 revolutions per minute, and a loaded speed of either 455 or 675 revolutions per minute.

Equipped with an external grinding wheel, as illustrated in Fig. 3, the die grinder has an over-all length of 11 inches. With an extension to suit the

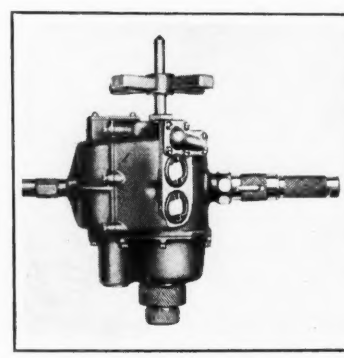


Fig. 2. Pneumatic Drill Having Drilling Capacities up to 2 1/4 Inches

use of a small grinding wheel, this device has an over-all length of 15 inches. It operates at a speed of 10,800 revolutions per minute.

Fig. 2 shows the latest addition to the "Little Giant" line of pneumatic drills made by the same company. This drill is built in reversible and non-reversible types for drilling holes from 1 1/4 to 2 1/4 inches, reaming holes from 1 to 2 inches, and tapping holes from 1 to 2 inches in diameter.

It is equipped with a sensitive throttle of new design, which gives an accurate speed control,

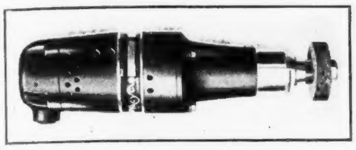
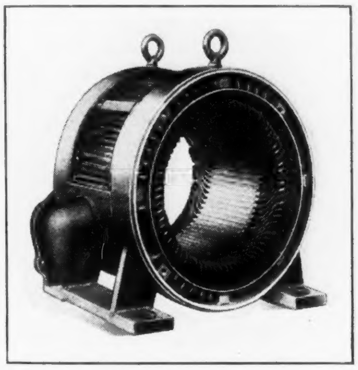


Fig. 3. "Hicycle" Die Grinder Arranged for External Grinding

a feature that is particularly desirable in staybolt tapping. A split crankcase permits easy removal of all pistons and the crank. The pistons are held to offset toggles by ball-and-socket joints which allow the pistons to turn in their cylinders and thus wear evenly.

RELIANCE ENCLOSED FAN-COOLED MOTORS

In a line of fully enclosed fan-cooled induction motors manufactured in sizes of 20 horsepower and larger by the Reliance Electric & Engineering Co., 1088 Ivanhoe Road, Cleveland, Ohio, the Mossay principle of cooling is used. This method gives extra cooling area through the use of tubes which extend over the outside of the stator.



Stator Construction of Large Reliance Fan-cooled Motors

A single internal fan on the rotor circulates the confined warm air through the tubes, while blasts of cool outside air are blown over the tubes from one end of the motor to the other. With the application of this method of cooling to large motors, fully enclosed fan-cooled motors can now be furnished in all sizes up to 150 horsepower.

SYKES GEAR-TOOTH COMPARATOR

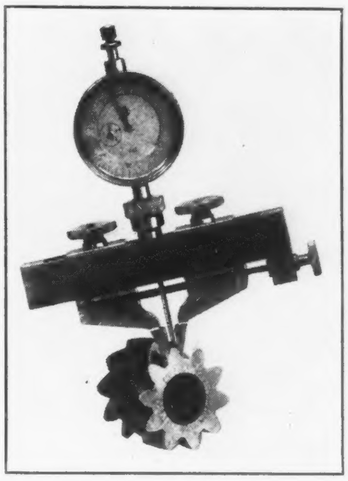
The Farrel-Birmingham Co., Inc., 344 Vulcan St., Buffalo, N. Y., has brought out a Sykes Model E gear-tooth comparator which incorporates a number of improvements over the comparator described in January, 1926, MACHINERY, page 415. For instance, on the previous model one of the jaws was fixed, while the other jaw and the spindle of the dial indicator were adjustable sidewise. On the new model, as may be seen from the illustration, both jaws are movable and the dial indicator spindle is stationary. This design makes settings of the instrument more convenient.

An additional feature is that the dial gage is adjustable in the holder. This permits the gage to be raised or lowered, and consequently it is not necessary to change the plunger or spindle of the gage to suit fine- and coarse-pitch gears.

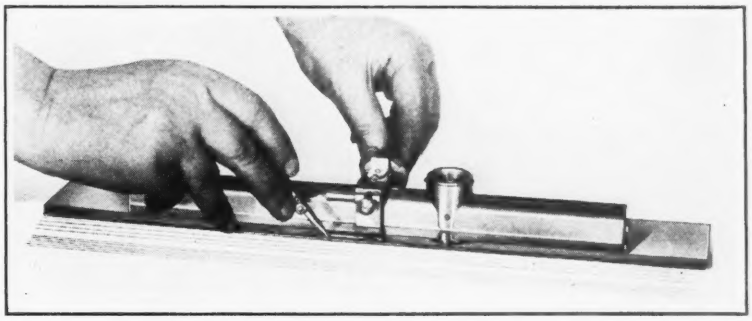
Another improvement is the fact that the jaws can be changed, whereas in the previous instrument with one fixed jaw, it was impossible to do this. The new instrument can be supplied with interchangeable jaws of different pressure angles.

MICROMETER ROLLING PARALLEL RULER

Accurate spacing and ruling of parallel lines is facilitated by the micrometer rolling parallel ruler which is being introduced on the market by the Alpha Instrument Co., 2103 K St., Northwest, Washington, D. C. This device is particularly suitable for drawing section lines, for spacing logarithmic or trigonometric lines, and for laying out coordinates. Two dials enable accurate adjustments in spacing to be made. Triangles may be applied to the edge of the device the same as against a T-square.



Sykes Gear-tooth Comparator Applied to a Herringbone Gear



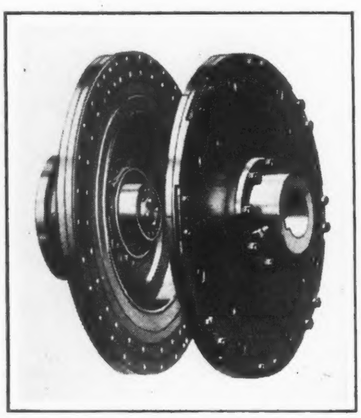
Micrometer Device for Accurately Spacing and Ruling Lines

CUTLER-HAMMER MAGNETIC CLUTCHES AND STARTERS

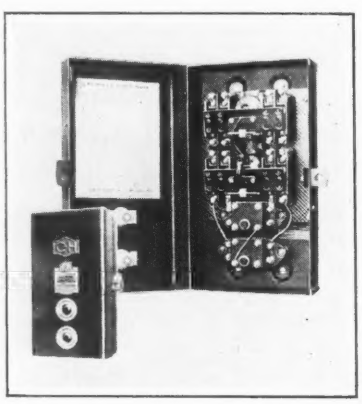
Consistent operating characteristics, easy installation, safety, and easy access to parts which may need renewal are advantages claimed for a line of magnetic clutches being introduced on the market by Cutler-Hammer, Inc., 1204 St. Paul Ave., Milwaukee, Wis. These clutches are known as the Type L, because the armature has an L-shaped cross-section so as to fit around the mag-

net coil. This construction has been used with a view to obtaining a greater and steadier pull throughout the life of the clutch lining.

The magnetic coil is wound on a sheet-metal form and is vacuum-impregnated before being inserted in the field member. A roller bearing mounted in the field member protrudes sufficiently to fit into a recess in the armature hub, and thus forms a common support for both clutch members. However, either member is free to revolve independently of the other when disengaged. An indicator shows the operator when the lining has been worn to the point where it should be readjusted.



Cutler-Hammer Magnetic Clutch



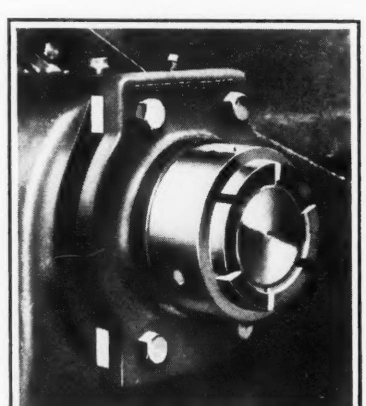
Automatic Starter for Two-speed Squirrel-cage Motors

A line of enclosed automatic motor starters intended for two-speed, separate-winding type squirrel-cage motors has been added to the electrical apparatus manufactured by Cutler-Hammer, Inc. These starters are of the across-the-line type, the winding being connected directly to the line. Both windings are protected against dangerous overloads by means of thermal overload relays. A push-button master switch with "Stop," "Low," and "High" buttons is used for controlling from a remote point.

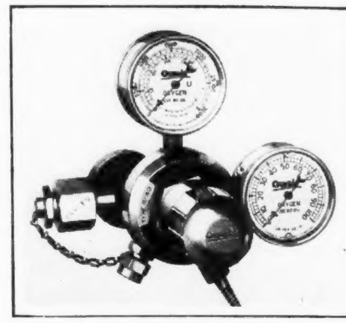
IMPROVED BEARING FOR ALLIGATOR SHEARS

An improved fulcrum pin bearing recently adopted for all the shears made by the Canton Foundry & Machine Co., Canton, Ohio, greatly simplifies the rebabbitting or rebushing of this bearing when it becomes worn. As may be seen from the illustration, the improved bearing consists of a split gun-metal bushing. The fulcrum pin is of a step-down design which, when assembled in the shear with two castellated nuts, serves as a tie to prevent the shear bed from spreading.

When the bearing needs rebushing, it is only necessary to take off the castellated nuts and remove the hardened steel collars and the cast-steel clamping plates attached to the shear. Then the four cap-screws taken from the clamping plate are screwed into the tapped holes in the flange of the gun-metal bushing. As the screws exert pressure against the shear bed, they pull out either the top or bottom bushing half, or both halves. It is unnecessary to dismantle any other part of the machine.



Fulcrum Pin Bearing for Canton Alligator Shears



Oxweld Two-stage Oxygen Regulator

OXWELD TWO-STAGE OXYGEN REGULATOR

A line pressure free from fluctuation is the advantage claimed for a two-stage oxygen regulator recently introduced on the market by the Oxweld Acetylene Co., 30 E. 42nd St., New York City. This device, which is intended for use in oxy-acetylene welding, provides a two-stage reduction through two separate and independent sets of diaphragms, valves, and springs.

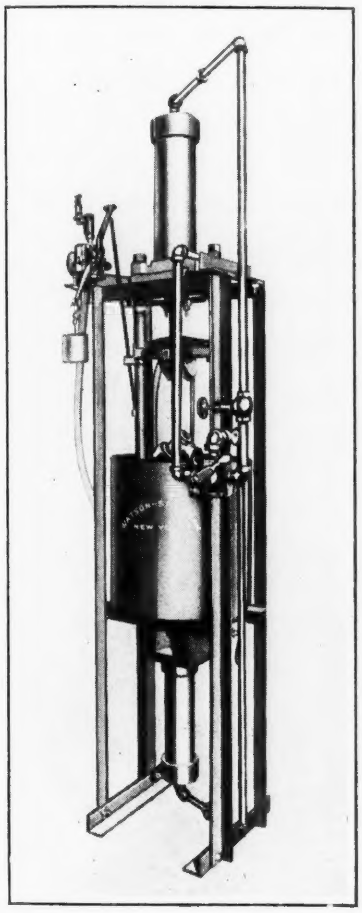
Oxygen at the full cylinder pressure of 2000 pounds per square inch enters the regulator through a stem-type valve and is controlled by the first stage diaphragm. In this stage, the pressure is reduced to less than 250 pounds per square inch. The oxygen then passes to a second stem-type valve and diaphragm assembly, where the pressure is reduced to the working pressure desired. This pressure is regulated by the operator through an adjusting screw.

WATSON-STILLMAN TESTING MACHINE FOR FITTINGS

Fittings made of brass, malleable iron, cast iron, and cast steel can be tested conveniently in a machine recently brought out by the Watson-Stillman Co., 73 West St., New York City. All fittings, including 90- and 45-degree el-

bows, tees, etc., in sizes up to 1 1/2 inches can be tested at an air pressure of 50 pounds per square inch under water with an operating pressure of 90 pounds per square inch. Fittings can be tested before or after tapping at a speed of from 500 to 600 per hour.

A fitting to be tested is placed in a die on the lower platen.



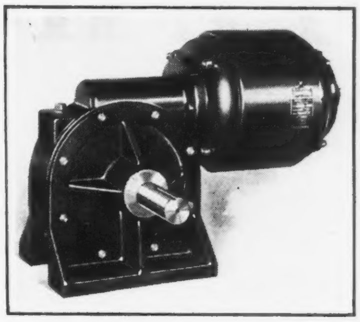
Machine which Tests Fittings under Water

Then the valve at the right of the press is moved to operate a top double-acting piston, which, on its down stroke, clamps the fitting in dies and forces the fitting under water in the tank. The air pressure is turned on automatically when the fitting is under water. By reversing the valve at the right of the press, the top piston is returned to the loading position and a bottom piston lifts the fitting out of the water and releases the air pressure in the fitting.

JANETTE SPEED REDUCER

A motor-driven speed reducer available in ratios of 50, 60, 70, 90, and 100 to 1, and with motors of 1/6, 1/4, and 1/3 horsepower, has been added to the products of the Janette Mfg. Co., 560 W. Monroe St., Chicago, Ill. As will be seen from the illustration, the gear housing is bolted directly to a machined pad on the end frame of the motor.

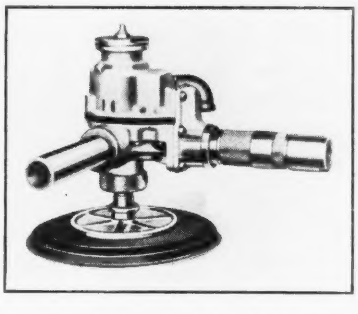
The gear-box itself is divided into three parts, the main housing and two sides. The main housing, which is bolted to the end frame of the motor, remains fixed, whereas the two sides, to which mounting feet are cast, are adjustable. By removing the eight hexagonal-head screws that hold each side plate to the main housing, the plates can be turned to any required position for mounting the speed reducer on a floor, wall, or ceiling. The reducer is obtainable with either right- or left-hand shaft extensions.



Janette Speed Reducer Made in Fractional-horsepower Sizes

ROTOR AIR TOOL

A pneumatic tool that is readily adapted for a variety of uses has been brought out by the Rotor Air Tool Co., 5704 Carnegie Ave., Cleveland, Ohio. Equipped with a flexible pad and sanding disk, as illustrated, this tool is suitable for rubbing filler on castings preparatory to painting them and for performing light sanding operations on either metal or wood. It can also be used for wire-brushing, drilling, nut-setting, and rubbing or polishing automobile bodies. Holes up to 3/8 inch can be drilled in close quarters, and nuts up to 3/8 inch can be set. The tool weighs only 6 pounds, and is available in three speeds of 1000, 1500, and 2000 revolutions per minute.



Rotor Air Tool Intended for a Variety of Operations

* * *

WESTERN METAL AND MACHINERY EXPOSITION

The National Western Metal and Machinery Exposition to be held in San Francisco, Calif., during the week beginning February 16, 1931, promises to be an event of considerable engineering importance to the Pacific Coast states. Coincident with the exposition, technical sessions of the National Western Metal Congress will be held. The headquarters of the Congress will be at the St. Francis Hotel in San Francisco, while the exposition will be staged in the Civic Auditorium.

Over 70,000 square feet of exhibition space will be devoted to displays of heat-treating and welding equipment, machine tools, metal-cutting tools, and equipment for use in oil fields. Metals and alloys, ferrous and non-ferrous, will also form a feature of the exposition.

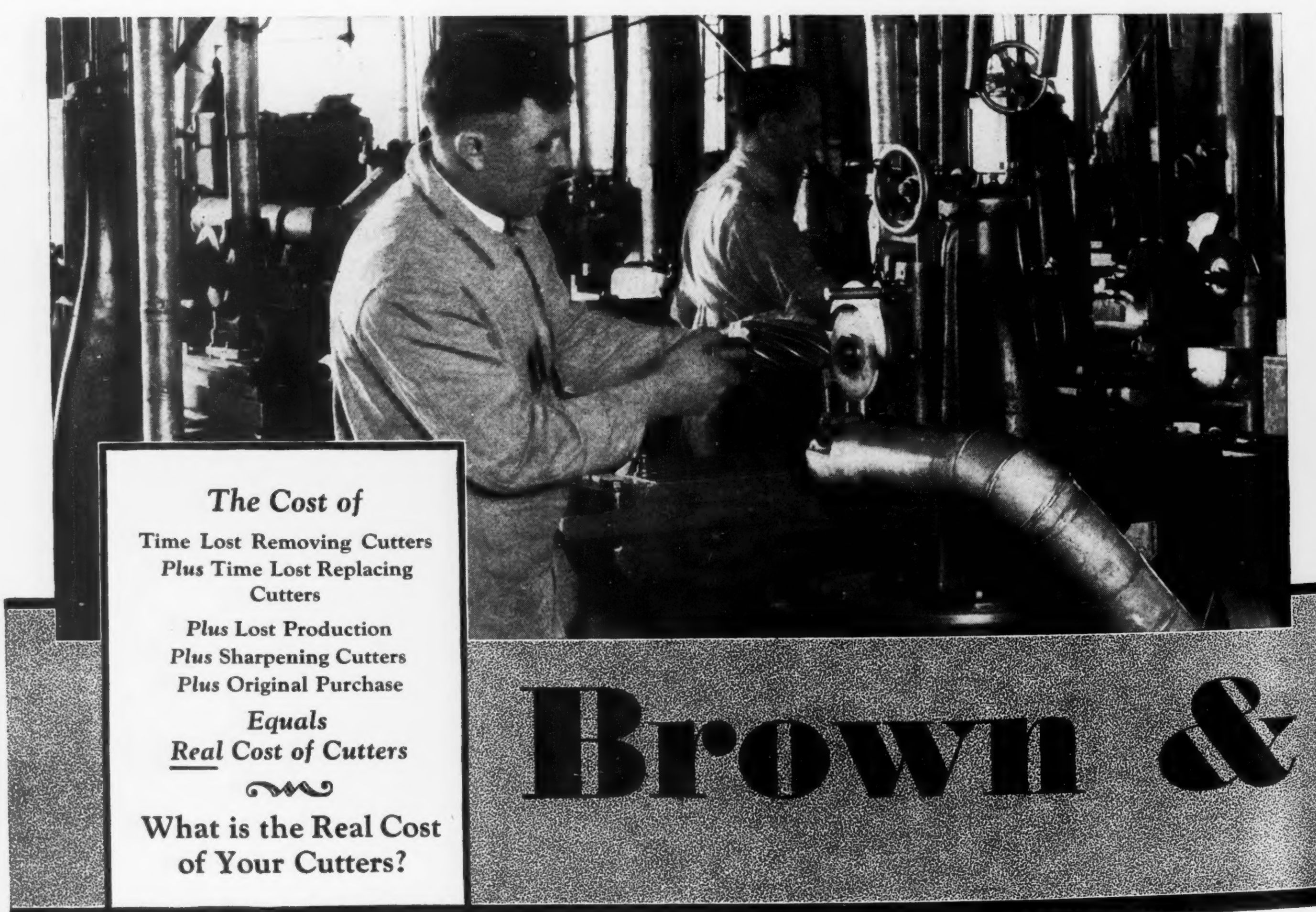
The American Society for Steel Treating, 7016 Euclid Ave., Cleveland, Ohio, is sponsoring the exposition, but numerous other engineering societies will cooperate, among which may be mentioned the American Institute of Electrical Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, the American Welding Society, and the Society of Automotive Engineers.

SHARPENING –

An Expense Which Good Cutters Do

A department devoted to sharpening cutters is a necessary part of every production plant. The use of good cutters, however, will keep the expenses of maintaining such a department—labor, wheels, equipment—at the lowest level.

Sharpening costs eat heavily into your profits. And, in addition, sharpening wears away the cutters and shortens their life—and so increases their cost. Brown & Sharpe Cutters will effect a large saving in your sharpening department. Ask for your copy of Small Tool Catalog No. 31, listing a complete line of cutters. Brown & Sharpe Mfg. Co., Providence, R. I., U.S.A.



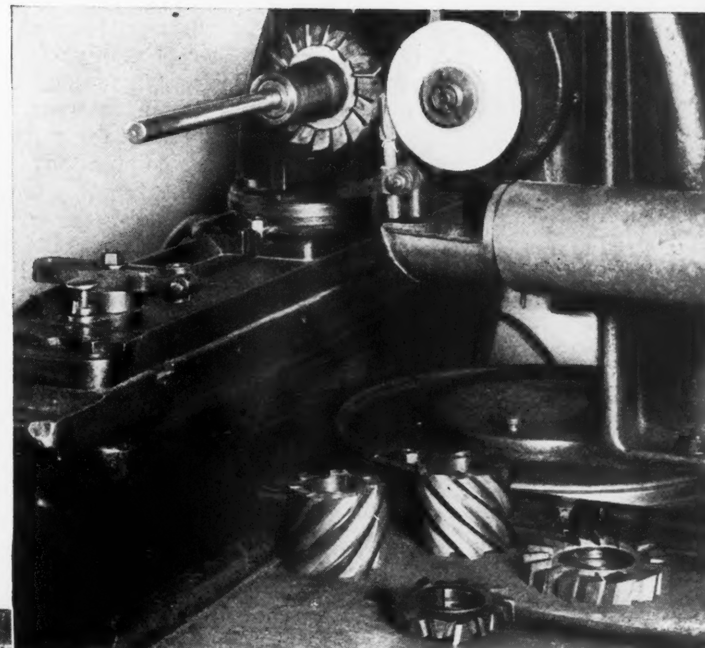
The Cost of

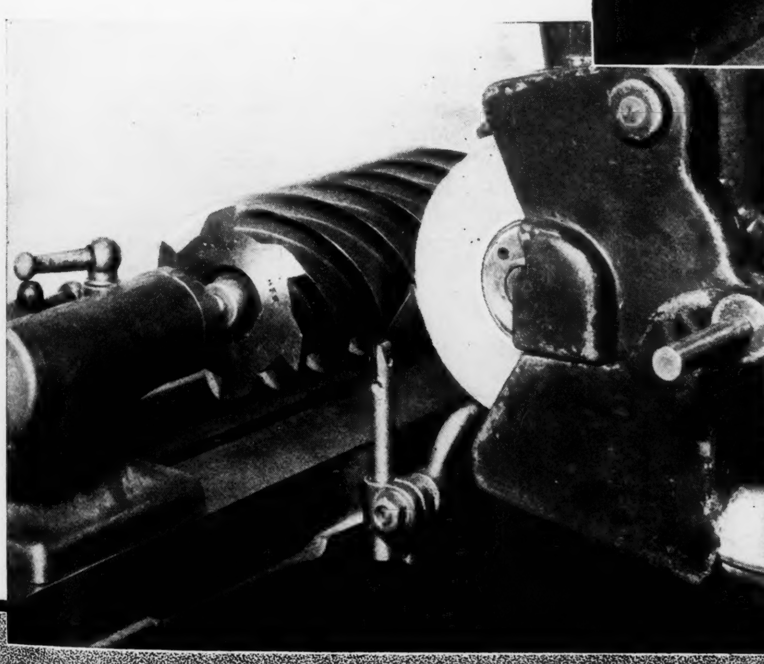
Time Lost Removing Cutters
Plus Time Lost Replacing Cutters
Plus Lost Production
Plus Sharpening Cutters
Plus Original Purchase
Equals
Real Cost of Cutters

What is the Real Cost of Your Cutters?

Do Much to Reduce

The sharpening of a gang of cutters often costs you a considerable sum. The ability of Brown & Sharpe Cutters to reduce the frequency of this costly sharpening makes them a profitable investment for you.





Even the sharpening of a cutter of simple design presents an appreciable item of expense. The use of Brown & Sharpe Cutters, even on the simplest jobs, will make a saving in your sharpening costs.

B·S

Sharpe Cutters

Lower Production Costs

NATIONAL METAL CONGRESS AND EXPOSITION

The setting of the National Metal Exposition in Chicago, September 22 to 26, was unusually attractive. This is the first time that this exposition had been staged in a hotel, for the simple reason that few hotels have facilities for the adequate presentation of so large a show. The Hotel Stevens in Chicago, however, was built with a view to providing exhibition space; and, in addition to the large exhibition hall on one of the lower floors of the hotel, several other large rooms contained part of the exhibits. Altogether 80,000 square feet of space was occupied by over 200 exhibitors. An attractive display was arranged in the grand ballroom of the hotel, which made a remarkable background for the exhibits.

In conjunction with the exposition were held the annual meetings of the American Society for Steel Treating and of the American Welding Society, as well as divisional meetings of the American Society of Mechanical Engineers and of the Institute of Mining and Metallurgical Engineers.

Some of the papers read before the Shop Practice Meeting of the American Society of Mechanical Engineers are abstracted in this number of MACHINERY. (See pages 106, 129, and 134.) One paper read before the Machine Shop Practice Division covered a description of the molding tools and hydraulic press equipment used by the Western Electric Co. in the manufacture of phenol plastic, hard rubber, and shellac plastic molded telephone parts. Another paper dealt with foreign and American practice in flange-mounting of motors, especially for machine tools, and contrasted the advantages of this and other types of mounting.

Automatic polishing was discussed in great detail, all the variables affecting the results in automatic polishing practice being covered. Still another paper described a commercial method of salvaging worn parts, or parts that have been machined under size, by the electrodeposition of iron. Such parts as thread and plug gages, arbors, reamers, motor shafts, gear centers, and similar steel parts are examples of work that may be salvaged in this way. The methods to be followed in the successful application of this process were described in detail. At another session, some of the important factors involved in the nitriding process were considered. The necessary equipment and the methods of performing the nitriding operation were described. The wear of nitrided articles was also discussed.

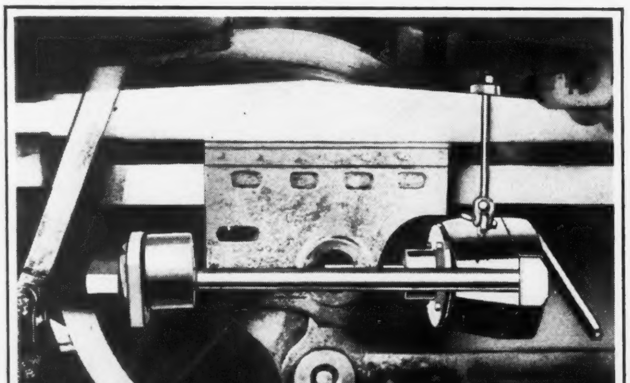
An unusually interesting address was presented by F. H. Willcox, vice-president of the Freyn Engineering Co., Chicago, Ill., at the dinner of the American Society of Mechanical Engineers September 24. Mr. Willcox spoke on the development of the iron and steel and other metal-working industries in Soviet Russia. He has had an extensive experience in that country, and his address presented a first-hand view of the Russian situation.

The 1931 National Metal Exposition will be held during the week beginning September 26 at Boston, Mass.

REMOVING PISTON-RODS FROM CROSS-HEADS

A pressure of 125 tons is developed in hydraulic equipment recently devised by the Watson-Stillman Co., 73 West St., New York City, for removing piston-rods from locomotive cross-heads. The "Piston Kicker," as the equipment is called, is attached to the locomotive frame in the manner illustrated. Hydraulic pressure is then obtained through the hand-pump shown.

In this method of separating the piston-rods from the cross-heads, the entire cross-head is used for purchase, and thus the pin fit is not marred or the cross-head cracked. An elevating and tilting buggy of special design comprises part of the outfit. This buggy is used to transport the "Piston Kicker" from job to job. It also simplifies setting up the equipment for each job.



Hydraulic Equipment for Forcing Piston-rods from Locomotive Cross-heads

* * *

In drawing cup-shaped parts of aluminum and zinc, very little pressure should be applied to the blank-holder. If this precaution is not observed, the metal will not flow well.

MUSEUMS OF PEACEFUL ARTS OPEN EXHIBIT

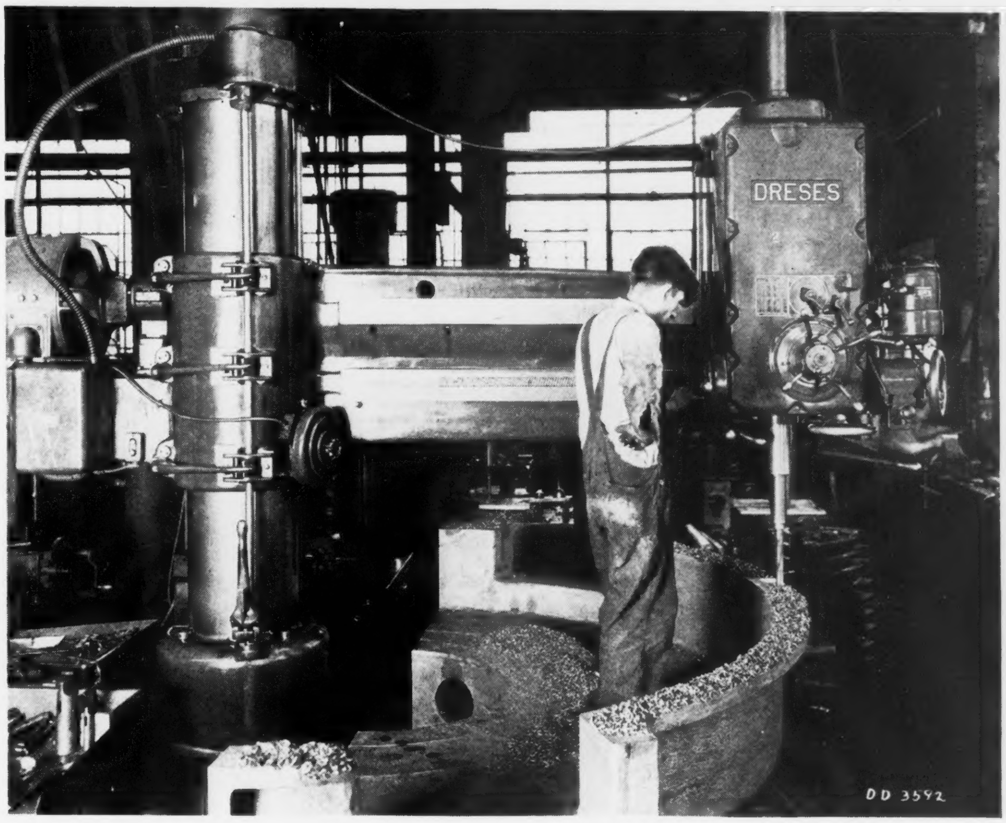
The first effort in America to depict, in condensed form, the sequence of scientific discoveries, inventions, and improvements in machinery that have transformed civilization during the past one hundred and fifty years is presented in a special exhibit called "Men and Machines," which opened at the new quarters of the Museums of the Peaceful Arts at 220 E. 42nd St., New York City, Friday, September 12. The exhibit is open to the public without charge until November 15.

More than two hundred companies and individuals have assisted in presenting the Museums' story of "Men and Machines." Among the exhibits, in the form of models, machines, or graphic devices, will be shown early and modern locomotives, telephones, machine tools, textile and agricultural machinery, printing presses, sewing machines, automobiles, airplanes, etc. The exhibit falls into two major time units—before 1780 and since 1780. The present exhibit will be followed by other temporary exhibits. Meanwhile, the preparations for the Museums' permanent exhibition will be continued.

* * *

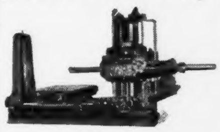
A wide application for gas and arc welding is found in the making of metal guards for machinery. In the past, these guards were the product of the tinsmith or the foundry, and if of complicated shapes, were quite expensive. Today most of these guards can be conveniently made from sheets welded together.

DRESES RADIALS

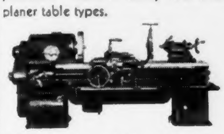


The
RYERSON MACHINE TOOL LINE

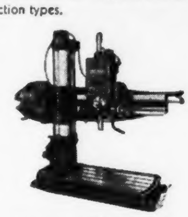
Built for Accuracy-Selected for Production-Ability



Ohio Horizontal Boring, Drilling and Milling Machines
Exclusive features assure permanent precision. Built in table, floor and planer table types.



Monotrol and Tritrol Lathes
Two types—both showing remarkable results on their particular work. 14 to 30 inch sizes in standard and production types.



Dreses Radial Drills
Strong, well-built, accurate tools with many time and labor saving advantages. Sizes 3 to 8 feet inclusive.

Ohio Shapers and Planers
Recognized for accuracy, speed and power. Built in all standard types and sizes.

RYERSON
Machinery Division
General Distributors Machine Tools
Structural and Plate Working Equipment, Sheet Metal Tools—Welders, Railroad Shop Machinery, Small Tools, etc.

Getting Production at Kling Bros.

Their Dreses Radial Finished this Job in 2 Hours and 50 Minutes

THE JOB—A section of a cast iron fan housing; weight 6,000 pounds. Drill 27 holes 1 3/8" diameter through flange 2" thick. Holes spot faced 2 1/2" diameter on under side. The holes were located from a template and drilled from center punch marks. Total time for the job, 2 hours and 50 minutes.

Nothing unusual about the time on this job—just regular shop time typical of the production they are getting every day at Kling Bros. Engineering Works in Chicago. They are more than satisfied with the results from their 6-foot Dreses Multi-Duty Drill.

Here are a few of the reasons for their selection of the Dreses to handle the wide variety of work that passes through their shop: (1) All control levers on the head are located below the top of the arm within easy reach; (2) Single lever controls elevation and clamping of arm; (3) Anti-friction mechanical hand clamp for column operated from head; (4) Ball bearing equipped throughout; (5) Automatic force feed lubrication; (6) Maximum number of speeds with fewer gears. These are only a few points of the Dreses construction. May we tell you the complete story?

Write for complete data on Dreses Radials.

THE DRESES MACHINE TOOL CO., Cincinnati, Ohio

General Distributors

JOSEPH T. RYERSON & SON INC.

Offices in Chicago and 23 other principal cities

SOLD THROUGH EXCLUSIVE DEALERS

PERSONALS

RICHARD FERGUSON, president of the Ferguson Gear Co., Gastonia, N. C., has been elected president of the Turner Mfg. Co. of Statesville, N. C., manufacturer of agricultural machinery. Mr. Ferguson will continue as the active head of both companies.

E. S. CONRAD who has been Pacific Coast district manager for the Square D Co., of Detroit, Mich., for ten years, has been appointed general sales manager of the Diamond Electrical Mfg. Co. of Los Angeles, Calif. The latter concern is affiliated with the Square D Co.

DANIEL SATHER recently completed twenty-five years of continuous service with the Watson-Stillman Co., 73 West St., New York City, in recognition of which he was presented, at the company's annual outing, with a watch to mark the event. Mr. Sather began as a machinist with the company, acquiring a broad knowledge of its products and shop operations. Eight years ago he was promoted to the premium and shop rate department. He is at present assistant in charge of this work, which comprises the estimating and setting of time for all production operations in connection with the company's premium plan.

Daniel Sather

MARTIN VAN STAPPEN has been appointed sales manager of the industrial blowers and turbine department of the Coppus Engineering Corporation, Worcester, Mass. ERNEST KUNDIG has been appointed sales manager of the house heating blower department, as well as export manager.

F. H. CHAPIN, president of the National Acme Co., Cleveland, Ohio, sailed for Europe September 5, on a five weeks' business trip. Most of Mr. Chapin's time will be spent in Germany, although he will also visit France and England. The purpose of the trip is to make connections for foreign representation.

JAMES W. OWENS, formerly Welding Aide for the Bureau of Construction and Repair of the U. S. Navy, has resigned as Director of Welding at the Newport News Shipyard to become associated with the Welding Engineering and Research Corporation, 25 W. 43rd St., New York City, as its director of engineering and secretary.

C. W. FRILLMAN has been appointed manager in charge of sales of the Apex Machine Co., Dayton, Ohio, manufacturer of drilling and tapping chucks, stud and nut setters, universal joints, and floating tool-holders. Mr. Frillman has had many years of experience in the tool business, both from a manufacturing and a sales standpoint.

W. J. COLES, director of Edgar Allen & Co., Ltd., Sheffield, England, arrived September 16 on the *Majestic* for a month's visit in the United States. Mr. Coles will make his headquarters at the Edgar Allen Steel Co., Inc., 741 Washington St., New York City. While in the United States he will also visit the branches of the company in Detroit and Chicago.

RAY P. TARBELL, formerly Cleveland district sales manager of the Lincoln Electric Co., has become a member of the firm of Robert E. Kinkead, Inc., consulting welding engineers of Cleveland, Ohio, of which concern he will become vice-president and secretary. Mr. Tarbell is a graduate of Dartmouth University and entered the employ of the Lincoln Electric Co. in 1918.

W. A. NUGENT, manager of the St. Louis office of the Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill., will be transferred to Chicago as manager of the Chicago territory; F. J. PASSINO, manager of the Pittsburgh office, will be located in St. Louis as manager of that territory; and T. J. CLANCY, of the Cleveland office, will be transferred to Pittsburgh as manager of that territory.

JOHN J. CONE, president of the Robert W. Hunt Co., consulting engineers, and a member of that company since its organization in 1888, has retired. C. B. NOLTE, vice-president and general manager, has been elected president and general manager, with headquarters at the general office, Chicago. J. C. OGDEN, a director and eastern manager of the company, has been elected vice-president, with headquarters at New York City.

W. R. DAVIS has been appointed manager of the eastern district of Robbins & Myers Sales, Inc., Springfield, Ohio, manufacturer of electric fans, motors, and material-handling equipment, succeeding C. A. STIRLING who recently resigned. Mr. Davis has previously been associated in executive capacities with the Electrical Research Products, Inc., the American Electric Motor Co., the Magnavox Co., the Manhattan Electrical Supply Co., and the Illinois Gas & Electric Co.

GORDON F. DAGGETT, Milwaukee, Wis., has been appointed branch manager for the Wisconsin territory of the Stephens-Adamson Mfg. Co. of Aurora, Ill. He will handle the company's line of conveying, screening, and transmission machinery for the state of Wisconsin, with offices at 735 Briarwood Place, Milwaukee. Mr. Daggett is a graduate of the University of Wisconsin and a member of the American Society of Civil Engineers and the Engineering Society of Wisconsin.

VICTOR M. PETERSON has been elected president and general manager of the Shafer Bearing Corporation, 6501-99 W. Grand Ave., Chicago, Ill., manufacturer of the Shafer self-aligning roller bearing. Mr. Peterson is also president of the Hannifin Mfg. Co. and the Sherman-Manson Mfg. Co., both of Chicago. Plans are being made for the extension of the Shafer line of roller bearings for industrial and railroad service. The research laboratory and engineering department facilities are also being enlarged and new equipment is being installed.

Victor M. Peterson

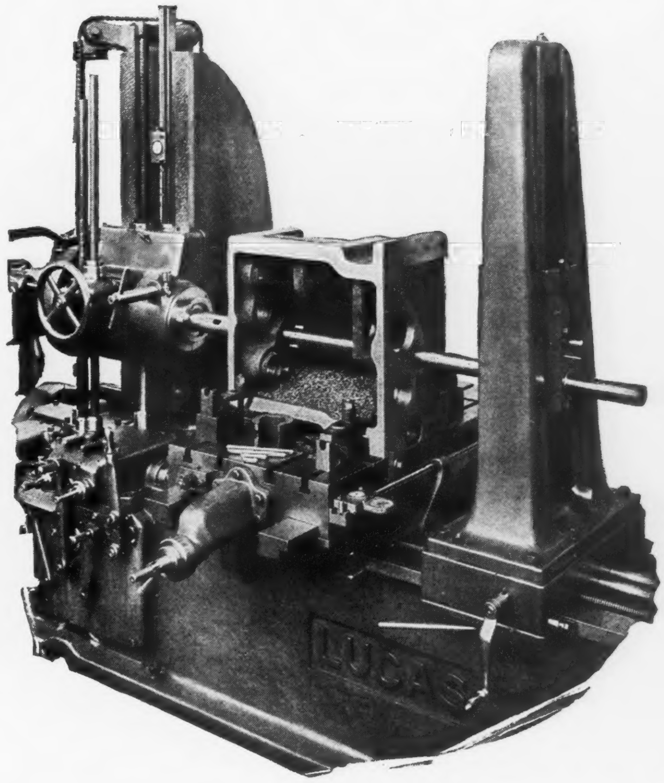
B. H. MACNEAL has been appointed southern district manager of the Crane-Shovel-Dragline Division of the Link-Belt Co., 300 W. Pershing Road, Chicago, Ill., with headquarters at the company's Birmingham, Ala., office. Mr. MacNeal will have charge of the territory between the Mississippi Valley and the East Coast, south of and including the states of Tennessee and North Carolina. He has been with the Link-Belt Co. for a number of years, and has a broad experience in both factory and field work.

MORRIS STONE, mechanical engineer of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has been awarded the Lamme scholarship which provides one year's advanced study at any college or university in America or abroad. The scholarship was established by the Westinghouse company in honor of Benjamin G. Lamme, who was for many years chief engineer of the company. Mr. Stone graduated from the engineering school of Harvard University in 1923 and received his master's degree in 1925, since which time he has been employed by the Westinghouse company.

Be Foresighted!

The best time to buy equipment is when you have your choice of the best made.

Don't wait until everybody is busy and your need is so urgent that you have to be satisfied (or rather, dissatisfied) with a substitute.



In The Lucas

"PRECISION" Horizontal Boring, Drilling and Milling Machine there is only one standard of quality—the highest. This standard is not lowered in rush times, in an attempt to meet abnormal demand and, naturally, like other things worth having, it is sometimes hard to get and must be waited for. Therefore, get it now while the getting is good!

THE LUCAS MACHINE TOOL CO., Cleveland, Ohio

FOREIGN AGENTS: Allied Machinery Co., Barcelona, Zurich. V. Lowener, Copenhagen, Oslo, Stockholm. R. S. Stokvis & Zonen, Paris and Rotterdam. Andrews & George Co., Tokyo. Ing. M. Kocian & G. Nedela, Prague. Emanuele Mascherpa, Milan, Italy.

OBITUARIES

CHARLES H. ALVORD

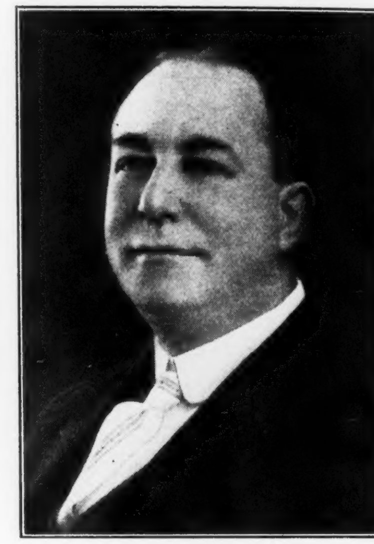
Charles H. Alvord, formerly president of the Hendey Machine Co., Torrington, Conn., died September 2 at his summer home at Pine Orchard, Conn., at the age of sixty-nine years. Mr. Alvord was born at Bolton, Conn., in 1861. In 1896 he became associated with the Hendey Machine Co., Torrington, Conn., as secretary. In 1907 he was elected vice-president and general manager, and in 1919 he became president, from which position he retired a few years ago owing to failing health. Mr. Alvord was a former director of the Connecticut Manufacturers' Association and a former member of the American Society of Mechanical Engineers. He was a member of the Connecticut State Legislature in 1918, and was chairman of the Torrington Board of Education from 1912 until his death.

Charles H. Alvord

CHARLES CURTISS COVENTRY, one of the founders of the Cleveland Tool & Supply Co. of Cleveland, Ohio, died of pneumonia, on September 18, at his home in Cleveland, aged sixty-five years. Mr. Coventry was president and treasurer of the company, and was active until a few days before his death.

FRANK L. DRIVER, SR.

Frank L. Driver, Sr., chairman of the Board of Directors and one of the founders of the Driver-Harris Co., Harrison, N. J., died in Belgium, August 26. He had been residing in that country for the last five years on account of ill health. Mr. Driver was born in Brooklyn in 1870. In 1899 he founded the Driver-Harris Co., with which he was associated until his death. It was largely due to his foresight and pioneering spirit that this business has grown to its present proportions. He was president of the company until 1925, when he retired to become chairman of the Board of Directors. The charm of Mr. Driver's personality won him many friends, who will regret to learn that he has passed away.



Frank L. Driver, Sr.

NEWS OF THE INDUSTRY

BIAX FLEXIBLE SHAFT CO. announces that the business of the company is now located in larger quarters at 22-14 Fortieth Ave., Long Island City, N. Y.

AMERICAN ENGINEERING CO., 2435 Aramingo Ave., Philadelphia, Pa., has appointed Starr-Carpenter, Park Building, Pittsburgh, Pa., agent for the company's electric hoists in the Pittsburgh district, and Weed & Co., 95 Swan St., Buffalo, N. Y., for the Buffalo district.

FOOTE BROS. GEAR & MACHINE CO., 111 N. Canal St., Chicago, Ill., has appointed J. L. Hart Machinery Co., S. Florida and Eunice Aves., Tampa, Fla., representative for the company in the state of Florida, south of a line drawn east and west across the state from Centralia to Titusville.

BARRETT-CRAVENS CO. announces the removal of its general offices and manufacturing plant to 101 W. 87th St., Chicago, Ill. At this address a new and modern plant has just been completed for the manufacture of lift trucks, "Steeleg" platforms, portable elevators, barrel trucks, and structural steel storage racks.

ST. JOHN X-RAY SERVICE CORPORATION, with offices at 505 Fifth Ave., New York City, announces that the company's laboratory has been removed to the Eveready Building, 30-20 Thomson Ave., Long Island City, N. Y. In this laboratory the company is prepared to handle parts that can be inspected by the X-ray method weighing up to 5 tons.

LANDIS MACHINE CO. OF CANADA, LTD., Welland, Ontario, has changed its name to the CANADIAN LANDIS MACHINE CO., LTD. This company makes Landis chasers and a complete line of Landis threading die-heads. J. N. Stickell is superintendent, and C. H. Gilland special sales representative. Landis threading equipment is handled throughout Canada by the Canadian Fairbanks Morse Co.

EX-CELL-O AIRCRAFT & TOOL CORPORATION, 1200 Oakman Blvd., Detroit, Mich., announces that the company is now in a position to produce milling cutters, counterbores, boring-bars, gear-cutters, broaches, and taps provided with Carboloy cutting edges. The establishing by the Continental Tool Division of the corporation of a line of Carboloy-tipped cutting tools will make this new cutting material available to users of small metal-cutting tools in general.

CARBOLOY CO., INC., announces that the general offices of the company have been removed from New York City to 2481 E. Grand Blvd., Detroit, Mich., the object being to centralize the various administrative departments so as to render a more efficient service to the industry. It is also announced that a material reduction has been made in the price of Carboloy. It is expected that this price reduction will encourage the necessary experimental work in many plants that will lead to the regular adoption of Carboloy for work for which it is suited.

BOYE & EMMES MACHINE TOOL CO., Cincinnati, Ohio, well-known manufacturer of lathes, has awarded a contract for the design and construction of a new plant on Caldwell Drive, Hartwell, Cincinnati, to the Austin Co. of Cleveland, Ohio. The present Boye & Emmes plant on Spring Grove Ave. will be vacated because the ground it occupies is required for the new union terminal development in Cincinnati. The new plant will be a one-story steel frame construction, 260 by 120 feet. It is expected to be completed by November 1.

SIMONDS SAW & STEEL CO., Fitchburg, Mass., announces the prize winners in the Eighth Alvan T. Simonds Annual Economic Contest which closed December 31, 1929. The first prize of $1000 was awarded to Walter Earl Spahr, professor of economics and chairman of the department of economics, School of Commerce, New York University; and the second prize of $500 was awarded to Ivan W. Elder, managing editor of the *North Pacific Banker*, Portland, Ore. The subject of the contest was "The Federal Reserve System and the Control of Credit."

J. H. WILLIAMS & CO., Buffalo, N. Y., manufacturers of drop-forgings and drop-forged tools, announce that after October 1 the company's general office and main sales office—exclusive of sales of special drop-forgings to order—will be consolidated with the present eastern sales office and warehouse at 75 Spring St., New York City. This change has been made chiefly in the interest of more frequent contact with customers and of closer concentration of sales activities. A service department will be retained in Buffalo.

COMING EVENTS

OCTOBER 7-8—Production Meeting of the Society of Automotive Engineers at the Book-Cadillac Hotel, Detroit, Mich. R. S. Burnett, director of production activities, Society of Automotive Engineers, 29 W. 39th St., New York.

OCTOBER 7-10—Twenty-fourth annual convention of the Illuminating Engineering Society at the Hotel John Marshall, Richmond, Va.

OCTOBER 8—Third annual convention of the Gray Iron Institute, to be held at the Hotel Cleveland, Cleveland, Ohio. Arthur J. Tuscany, manager, Terminal Tower Building, Cleveland, Ohio.

OCTOBER 9-11—Fall meeting of the American Drop Forging Institute at Briarcliff Lodge, Briarcliff Manor, N. Y. Donald McKaig, secretary, 1608 Law and Finance Bldg., Pittsburgh, Pa.

OCTOBER 15-17—Seventeenth national convention of the Society of Industrial Engineers, to be held at the Mayflower Hotel, Washington, D. C. George C. Dent, executive secretary, 205 W. Wacker Drive, Chicago, Ill.

OCTOBER 23—Meeting of the Steel Founders' Society of America, Inc., at the Pennsylvania Hotel, New York City. G. P. Rogers, Managing Director, 932 Graybar Building, New York City.

DECEMBER 1-6—Ninth National Exposition of Power and Mechanical Engineering in the Grand Central Palace, New York City.

DECEMBER 1-6—Fifty-first annual meeting of the American Society of Mechanical Engineers in the Engineering Societies Building, New York City. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

FEBRUARY 16-20, 1931—Second National Western Metal Congress and Exposition to be held in the Civic Auditorium, San Francisco, Calif., under the auspices of the American Society for Steel Treating. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland, Ohio.

NEW BOOKS AND PUBLICATIONS

EYES SAVED IN INDUSTRY. A summary of the experience of 583 companies. 24 pages, 6 by 9 inches. Published by the National Society for the Prevention of Blindness, 370 Seventh Ave., New York City. Price, 15 cents.

RELATIONSHIPS BETWEEN ROCKWELL AND BRINELL NUMBERS. By S. N. Petrenko. 50 pages, 6 by 9 inches. Published by the United States Department of Commerce, Washington, D. C., as Research Paper No. 185 of the Bureau of Standards. Price, 10 cents.

DIE-HEAD CHASERS (For Self-opening and Adjustable Die-heads). 18 pages, 6 by 9 inches. Published by the United States Department of Commerce, Washington, D. C., as Simplified Practice Recommendation No. R51-29 of the Bureau of Standards. Price, 10 cents.

THE THEORY OF EXTERNAL LOADS ON CLOSED CONDUITS IN THE LIGHT OF THE LATEST EXPERIMENTS. By Anson Marston. 36 pages, 6 by 9 inches. Published by the Iowa State College, Ames, Iowa, as Bulletin No. 96 of the Engineering Experiment Station.

SAFETY MEETINGS. Industrial Safety Pamphlet No. 8, on methods of stimulating interest in industrial safety through shop meetings. 16 pages, 5 1/2 by 7 1/2 inches. Published by the Policyholders' Service Bureau, Metropolitan Life Insurance Co., 1 Madison Ave., New York City.

FIVE YEARS OF RESEARCH IN INDUSTRY. Compiled by Clarence J. West. 91 pages, 6 by 9 inches. Published by the National Research Council, 29 W. 39th St., New York City. Price, 50 cents.

This book contains a list of articles that have been published in the last five years on research undertakings in practically every field of engineering.

NOTES ON SCREW GAGES. By the Gage Testing Staff of the Metrology Department. 88 pages, 7 by 9 1/2 inches. Published by His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C.2, England. Price, 4s, net. Copies of this publication can be obtained in the United States from the British Library of Information, French Building, 551 Fifth Ave., New York City.

REPORT UPON THE EFFECT OF LENGTH OF THREAD EXPOSURE UPON THE STATIC TENSILE STRENGTH AND ENERGY TO RUPTURE OF STANDARD V AND DARDELET THREAD AND NUT CONNECTION. Made for the Dardelet Thread Lock Corporation, 120 Broadway, New York City by the Testing Laboratories, Department of Civil Engineering, Columbia University, Morningside Heights, New York City. 12 pages, 6 by 9 inches.

RESEARCH ON WORM DRIVES. (Untersuchungen an Zylinder- und Globoid-Schneckentrieben). By Dr.-Ing. Gunter Maschmeier. 47 pages, 8 by 11 inches. Published by R. Oldenbourg, Munich and Berlin, Germany. Price, 4 marks.

This book is available in German only. It contains the results obtained by the author in tests made on regular and globoid worm drives. Both theoretical considerations and results of practical tests are outlined. The author points out that the agreement between the theoretical deductions and the actual tests indicates the accuracy of his conclusions.

WELD DESIGN AND PRODUCTION. By Robert E. Kinkead. 108 pages, 6 by 8 1/2 inches. Published by the Ronald Press Co., 15 E. 26th St., New York City. Price, $4.

This book has been written to bring together the basic information on welding. It covers both the procedure and control of welding and the cost elements of welding jobs. Particular attention has been paid to the factor of safety in welded structures. The material is divided into ten chapters, headed as follows: Prediction in Manufacturing; Why Welds are Made; How Welds are Made; Effect of Physical Conditions on Weld Behavior; Repreductions of Weld Sections; Actual Welding Conditions; Welding Procedure Control; Machine Welding; Research and Development; and Summary.

MECHANICAL ENGINEERS' HANDBOOK. Lionel S. Marks, Editor-in-chief. 2264 pages, 5 by 7 inches. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York City. Price, $7.

This is the third edition of a handbook for mechanical engineers which is intended to supply both the practicing engineer and the student with a reference work that covers the field of mechanical engineering comprehensively. The present edition has been brought out in order to include the developments that have taken place in the six-year interval between the second and third editions. A new section has been added on the subject of vibration, and the sections discussing welding have been revised to keep pace with the developments in this field. A number of new subjects are covered, such as industrial combustion furnaces, electric furnaces, and high-pressure and low-pressure carbonization of coal. The various sections have been contributed by different engineers, the larger sections being subdivided into a number of smaller parts. For example, the discussion of machine shop practice is now subdivided into five sections, each of which is contributed by a separate author.

MACRAE'S BLUE BOOK AND HENDRICKS COMMERCIAL REGISTER. 3308 pages, 8½ by 11 inches. Published by MacRae's Blue Book Co., 18 E. Huron St., Chicago, Ill. Price, $15.

The thirty-eighth annual edition of this well-known reference work, which has just been published, contains the same carefully classified information as previous editions, brought up to date. Little need be said about the value of this work to those who have had occasion to make use of it in the past, but for the information of those who may not be familiar with the contents, a brief review of the sections may be of value.

The book contains six separate divisions: First comes a complete alphabetical list of manufacturers and distributors with their addresses. Next follows the index to the classified directory which comprises the main part of the work. The index contains approximately 95,000 items pertaining to materials, equipment, and products, the manufacturers and distributors of which are listed in the classified directory, which occupies 2142 pages, printed in three columns.

Next follows a Canadian section, giving addresses of manufacturers and distributors in Canada as well as a classified index of materials, equipment, and products. The Canadian section covers close to 200 pages. A Trade Facilities section follows, listing every town of 1000 or more population, with the name of the leading commercial body and its secretary, the leading bank and its cashier, all railroads entering the town, and the names of warehouses. The last section, covering 308 pages, gives trade names of industrially used products. Apart from the value of the rest of the work, this section alone will be found of great convenience to buyers of industrial products who are endeavoring to find the name of the manufacturer of a material or of equipment, only the trade name of which is known.

A directory and commercial guide of this kind is practically indispensable in any industrial organization that finds it necessary to locate sources of supply. The directory can also be used conveniently as a mailing list for reaching specific industries.

NEW CATALOGUES AND CIRCULARS

STEEL CASTINGS. Lebanon Steel Foundry, Lebanon, Pa. Circular on stainless steel castings.

DIE-STOCKS. Borden Co., Warren, Ohio. Bulletin A-1, illustrating and describing the new Beaver three-way die-stocks.

COMPRESSORS. General Electric Co., Schenectady, N. Y. Bulletin GEA-1280, covering centrifugal compressors.

FURNACES. General Electric Co., Schenectady, N. Y. Booklet GEA-1291, entitled "Copper Brazing and Copper-Brazing Furnaces."

BRAKES. Electric Controller & Mfg. Co., Cleveland, Ohio. Folder illustrating and describing the WB brake for mechanical as well as electrical operation.

TWIST DRILLS. Morse Twist Drill & Machine Co., New Bedford, Mass. Circular illustrating the company's facilities for heat-treating drills and other tools.

INDUSTRIAL HEATERS. Buffalo Forge Co., 144 Mortimer St., Buffalo, N. Y. Circular illustrating and describing the Buffalo Model B unit heater for industrial applications.

FLEXIBLE COUPLINGS. Westinghouse Electric & Mfg. Co., Nuttall Works, Pittsburgh, Pa. Circular 1887, illustrating and describing Westinghouse-Nuttall flexible couplings.

STEEL DEOXIDIZER. Vanadium Corporation of America, 120 Broadway, New York City. Circular describing the use of Alsifer, a material used for deoxidizing molten steel.

GRINDING MACHINES. Diamond Machine Co., 9 Codding St., Providence, R. I. Bulletin 635, illustrating and describing the Diamond Type G hydraulic-drive surface grinding machine.

PUNCHES. Whitman & Barnes, Inc., Detroit, Mich. Catalogue 94, illustrating and describing Hercules interchangeable punches and retainers, an entirely new development by the company.

DIE-CASTINGS. Die Casting Equipment & Engineering Co., Inc., 60 E. 42nd St., New York City. Circular entitled "A Message of Importance to Manufacturers and Users of Die-castings."

DIE-HEADS. Borden Co., Warren, Ohio. Circular illustrating and describing bolt die-heads for the No. 3 Beaver Jr. ratchet die-stock for threading bolts or rods from 1/4 to 1 inch, inclusive.

SPEED REDUCERS AND FLEXIBLE COUPLINGS. Falk Corporation, Milwaukee, Wis. Circular pointing out the essential features of the Falk speed reducers and flexible couplings.

STARTERS AND SPEED REGULATORS. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Leaflet 20486, covering manual type starters and speed regulators for wound-rotor motors.

NITRIDING. Hevi Duty Electric Co., Milwaukee, Wis. Bulletin 830, entitled "Essentials of Successful Nitriding." The new process as well as equipment for its successful use are described.

SPEED REDUCERS. Westinghouse Electric & Mfg. Co., Nuttall Works, Pittsburgh, Pa. Bulletin illustrating and describing Westinghouse-Nuttall speed reducers with single and double reductions.

VALVES. Jenkins Bros., 80 White St., New York City. Circular 141, illustrating and describing Jenkins standard bronze valves for 150 pounds steam working pressure, or 250 pounds oil, water, or gas working pressure.

ARC WELDING. General Electric Co., Schenectady, N. Y. Booklet GEA-1161, entitled "Arc Welding Structural Steel," containing facts useful to those engaged in the design, fabrication, and erection of steel structure.

ELECTRICAL MEASURING INSTRUMENTS. Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa. Catalogue 80, containing data on resistance thermometers for recording, controlling, and indicating temperatures.

PUMPS. Rothweiler & Co., 2430 First Ave. South, Seattle, Wash. Circular illustrating and describing the Rothweiler "Useful" pump which is suitable, among other purposes, for pumping cutting compounds and oil in machine shops.

GEARS. General Electric Co., Schenectady, N. Y. Circular GEC-90, containing information on Textolite gears. Bulletin GEA-1201, illustrating and describing GE herringbone gears and their application for different classes of service.

ELECTRIC WELDING EQUIPMENT. Thomson-Gibb Electric Welding Co., Lynn, Mass. Bulletin 109, illustrating and describing the Thomson-Gibb automatic fabric welder which welds over fifty tons of wire fabric in ten hours.

POWER SHEARS. Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y. Circular 371, illustrating and describing Niagara power squaring shears, also featuring the Niagara screw adjustable back gage and patented hold-down.

ELECTRIC MOTORS. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Leaflet 20490, illustrating and describing Type CW wound-rotor induction motors, suitable for pumps and compressors and other continuous duty services.

V-BELT DRIVES. Medart Co., 3500 De Kalb St., St. Louis, Mo. Folder illustrating and describing the Medart V-belt drive, giving complete price list of sheaves and belts, and an outline of the necessary data required for designing V-belt drives.

MATERIALS HANDLING EQUIPMENT. Cleveland Electric Tramrail Division of the Cleveland Crane & Engineering Co., Wickliffe, Ohio. Circular illustrating the Cleveland tramrail system of overhead handling as applied to the automobile industry.

PLATING SOLUTIONS. Hanson-VanWinkle-Munning Co., Matawan, N. J. Booklet entitled "Simple Methods of Analyzing Plating Solutions," giving detailed directions for performing analyses of a large variety of plating solutions. Sent free upon request.

ARC WELDING. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Publication entitled "Arc Welding Data Bulletin No. 14," in which automatic arc welding applications are described and cost comparisons between hand and automatic welding are made.

MANGANESE STEEL. American Manganese Steel Co., Inc., Chicago Heights, Ill. Bulletin illustrating a variety of products made from Amsco manganese steel. The bulletin also contains concise information about the properties and application of manganese steel.

OIL AND GREASE RETAINERS. Chicago Rawhide Mfg. Co., 1302 Elston Ave., Chicago, Ill. Booklet entitled "Perfect Oil and Grease Retainers," illustrating and describing a device for sealing the lubricant in any machinery application in which oil or grease is used.

PULVERIZERS. Whiting Corporation, Harvey, Ill. Bulletin 10, descriptive of the Whiting No. 3 unit pulverizer, which is equipped with a new high-low velocity burner for industrial furnace and small boiler firing. Copies of the bulletin will be sent to those interested upon request.

ELECTRIC TOOLS. Standard Electrical Tool Co., 1948 W. 8th St., Cincinnati, Ohio. Catalogue 36, illustrating and describing the company's complete line of electric drills, grinders, buffers, and polishers. The catalogue contains 64 pages, 8 1/2 by 11 inches, and also includes price list.

TURRET LATHES. International Machine Tool Co., Indianapolis, Ind. Bulletin illustrating and describing the Libby Type H full-swing side carriage heavy-duty turret lathe for rapid production. A detailed description of the lathe is given, as well as a list of the principal dimensions and capacities.

MILLING MACHINE ARBORS. Kearney & Trecker Corporation, Milwaukee, Wis. Catalogue 38, entitled "K and T Arbors." The catalogue illustrates and describes the methods used in making milling machine arbors at the Kearney & Trecker plant, and lists the types and sizes of arbors available.

DIAL GAGES. B. C. Ames Co., Waltham, Mass. Catalogue entitled "Ames Gages," illustrating and describing micrometer dial gages, together with their application in upright gages, amplifying comparators, dial micrometers, gages with magnetic mounting, and special precision inspection instruments or verifiers.

MULTIPLE-SPINDLE HEADS. Ex-Cell-O Aircraft & Tool Corporation, 1200 Oakman Blvd., Detroit, Mich. Catalogue illustrating and describing the Krueger multiple-spindle heads for drilling, facing, counterboring, hollow-milling, tapping, reaming, threading, and countersinking. A variety of heads are illustrated.

BALL BEARINGS. Strom Bearings Co., Division of Marlin-Rockwell Corporation, 4535 Palmer St., Chicago, Ill. Catalogue 12, describing Strom and M.R.C. single- and double-row radial and angular contact bearings and M.R.C. thrust bearings. The catalogue also gives load ratings, engineering data, and price list.

ELECTRIC TOOLS. Black & Decker Mfg. Co., Towson, Md. Catalogue 2, covering the Van Dorn-Black & Decker line of electric drills, reamers, screwdrivers, tappers, nut runners, stud setters, portable buffers, portable grinders, and disk sanders. Catalogue 9, covering heavy-duty grinders and buffers in sizes of from 1 to 15 horsepower.

ELECTRIC MOTORS. Master Electric Co., Dayton, Ohio. Publication entitled "Your Guarantee for More and Better Master Motors," containing a description of the facilities of the company for building electric motors and serving the motor-using industries. The complete line of Master motors, ranging from 1/20 to 10 horsepower, is also illustrated.

INSTRUMENTS. Gaertner Scientific Corporation, 1201 Wrightwood Ave., Chicago, Ill. Catalogue B-1930, entitled "Chronographs and Accessories." The chronograph is an instrument for recording time intervals of practically any duration, and may be used advantageously in the study and analysis of the action of intricate machinery. Also, bulletins on photoelectric cells and laboratory supplies.

INDUSTRIAL OVENS. Gehnrich Oven Co., Inc., Skillman Ave. and 35th St., Long Island City, N. Y. Catalogue illustrating and describing industrial ovens for heat-treating, japanning, enameling, lacquering, core baking, and many other industrial uses. These ovens may be of either the gas-fired or electric type. The catalogue also contains numerous illustrations of industrial applications of these ovens.

SPEED REDUCERS. Gears and Forgings, Inc., Cleveland, Ohio. Bulletin B-1, illustrating and describing planetary speed reducers, explaining the advantages of the planetary construction and giving details of construction and operation, with examples of installations. Bulletin C-1, illustrating and describing worm-gear speed reducers, with illustrations of installations and complete ratings of different sizes and types.

DIVIDING MACHINES. R. Y. Ferner Co., Investment Building, Washington, D. C., representative in the United States of the Societe Genevoise d'Instruments de Physique, Geneva, Switzerland. Catalogue 508, illustrating and describing high precision linear and circular dividing machines for laboratory and shop use. The catalogue covers 36 pages, 8 1/2 by 11 inches. Detailed information as to both the construction and use of dividing engines is included.

SPEED REDUCERS. Winfield H. Smith, Inc., 116 Eaton St., Springville, Erie Co., N. Y. Catalogue 25, describing a complete line of speed reducers of small and fractional horsepower capacity. Many new speed reducers, including a line of ball and roller bearing equipped units, are listed, as well as a line of light power transmission equipment — grooved pulleys, hangers, pillow blocks, collars, and couplings.

ELECTRIC EQUIPMENT. General Electric Co., Schenectady, N. Y. Bulletins GEA-858A, on low-speed direct-current generators; GEA-211A, on Type FK-5 oil circuit breakers; GEA-1290, on control equipment for steel mill auxiliaries; GEA-388A, on control equipment for crane-bridge, and trolley motors; GEA-1286 and GEA-1230A, on industrial haulage locomotives; GEA-885A, on super synchronous motors; GEA-394B, on induction motor-generator sets; GEA-530B, on control equipment for crane hoist motors; GEA-823C, on atomic-hydrogen arc-welding equipment.